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CONTENTS

EDITORIAL:
- Editorial Notes 359
- The Policy of Railway Sinking Funds 360
- The Growth of Traffic in the United States 361
- Railway and Industrial Monopolies 361
- Car Ventilation 362

LETTERS TO THE EDITOR 363

ILLUSTRATED:
- The Peking-Kalgan Railway 366
- Ventilation of Sleeping Cars 371
- The Burlington Suction Dredge 375
- Mallet Locomotive with Twenty Drivers for the Santa Fe 379
- Freight Car for Shipping Transformers 381

MISCELLANEOUS:
- Letters from An Old Railway Official to His Son, a General Manager 369
- Government Report of Bridgeport Derailment 374
- Train Resistance 377
- Train Telephone Sets 378
- Tunnel Ventilating Plants 381
- Foreign Railway Notes 377, 378, 381

GENERAL NEWS SECTION 382

A RESIDENT of the state of New York holds a railway bond of $1,000. Under the new law of the state, by sending to the comptroller a tax of five mills or $5, the bond becomes permanently exempt from taxation—otherwise, under the statutes, it must incur local taxation. The same holder of the railway bond moves over the state line eastward and becomes a resident of Connecticut. Unless his bond happens to be issued by a Connecticut railway—in which case it escapes all tax to the personal holder resident of the state—he can escape local taxation, as in New York, through payment of a tax to the state. But, instead of $5 with permanent exemption, he must pay 4 mills, or $4 *yearly*. If he holds the bond, say, for ten years, his taxes are $40, instead of the $5 in New York state. The disparity between two adjacent states illustrates sharply the divergencies in railway taxation in the states, and in both cases may mean double taxation. For if the New York resident had held a New Haven railway bond, it would have already paid a corporate tax of 1 per cent. on its par to Connecticut; while the Connecticut resident's bond—if of an outside railway—has carried also its outside corporate tax, direct or indirect. Nevertheless, the new statute of New York, substituting permanent exemption from railway and other bonds on payment of a small state tax, is a direct step in advance. It does not extinguish the inequitable double taxation levied on both the railway corporation and its bondholders, but does materially modify it; it does not eliminate the tax dodgers, but it tends to reduce them numerically; and it sets an example for other states where the blending of personal and corporate railway taxation has been as conspicuous as unjust.

THE bulletin of the New York state department of labor for June last showing that for the first three months of the present calendar year there were more idle persons than during the same period in 1910, but an increase in wages from $3.18 to $3.26 per day, brings up a railway reminiscence which for other reasons is likely to remain vivid. It will be recalled that early in the year 1908 railway managers had decided that the time had come for a reduction of wages to meet the great decrease of traffic and that President Roosevelt just then checked the plan by his notification that federal investigation would follow any reduction. Read between and under its lines it was tantamount to the statement that federal sympathies and influence would be on the side of a strike should one ensue. The normal and logical result followed. The railways reduced their working force instead of wages. They were compelled to employ fewer men at the old rate instead of the larger number of men at the reduced wage; and in this the unions not only acquiesced, but in some cases the idleness and hardship of the discharged men that the rest might retain their old pay was hailed as a triumph of the union principle. Certainly we do not now recall that any union that would have assessed itself for strikers levied any assessment in 1908 for the idle members who were victims of hard times on the railways. Whether the increased wage along with increased idleness which the department of labor now returns has in it the direct influence of the Roosevelt utterance of three and a half years ago cannot be stated positively; but the indirect influence, at least, can be strongly inferred. The inference is clearer still that to the employer the necessity of cutting down forces continues to outweigh the risk of a strike. As the lower paid employees go first, the average raise in rate of pay indicated by the official figures is readily explained.

FIREMEN can be trained to be competent and efficient monitors for enginemen, if reasonable effort is put forth to that end. We said this last week, basing the statement on what we believe to be reasonable considerations and on well-known facts and good evidence. At the same time the rules and practice of many roads either discredit the statement or, in effect, deny its importance; and, therefore, it is gratifying to be able to print, in this issue, a letter from "L. N. S.," confirming what we said. "L. N. S." is an experienced operating officer of a large eastern road (but his name does not begin with S), and his reputation backs up his words. Every one must admit that with two lookouts on every engine, each animated by an intelligent purpose to aid the other, the disregard of signals, with its disastrous consequences, would be immensely reduced. This being so, the question at issue is a vital one on every road. "L. N. S." writes interestingly on other phases of discipline, and with a vigorous pen. His thrusts at the brotherhoods, and at congressmen hit the mark. His suggestion that the Federal steamboat inspection service ought to be copied in the railway field is in the same line with the recent recommendation of an officer of the

Southern Pacific, who told us about the effectiveness of the government's marine supervision on the Pacific coast; but the majority of conservative railway officers will be slow to endorse the idea. They will be sure to recall the well-known dangers of governmental action in such matters—political appointees and inefficiency. Admitting the efficiency of the steamboat supervision, could the same be duplicated in the railway service? For ourselves, the *bête noire* of this problem is the difficulty of retaining efficient superintendents. Straight-from-the-shoulder discipline is all that "L. N. S." claims for it; but the campaign is a long one, and too frequent changing of shoulders has upset many promising schemes.

"L. N. S." is not the only reader interested in discipline, as will be seen by the other letters printed along with his. The government investigation on the Bridgeport collision is reported in this issue, also. Inspector Belnap recommends automatic stops and the use of approach-locking, though the absence of approach-locking had nothing to do with this accident. As to whether anything can be done, more than is now done, to insure a good lookout on engines, he says nothing. Without automatic stops he would require that, in cases like this, trains be brought to a stop before setting the switches for the crossover. In recommending such extreme caution he has the support of the English Clearing House code, which prescribes similar safeguards. How strictly the English railways adhere to requirements of that kind is, however, another question. Inquiries have frequently shown that when in a hurry they relax some of the rigid provisions of their rules. Either in England or America, a reduction of speed, and a whistle acknowledgement to the signalman that the speed limit had not been forgotten, ought to be a sufficient safeguard. As to the recommendation to use automatic stops everywhere, the most natural observation that will occur to most railway officers is that Mr. Belnap is fortunate to have been able to settle so knotty a question in six lines!

THE British railway strike is of interest to American railway men, chiefly by reason of the marked differences of conditions in the two countries. Strikes of shopmen occurred three weeks ago, but the main strike lasted only two days. Trainmen, signalmen and the lower grades seem to have been banded together. But the traditional English conservatism is found among all classes, and the percentage of men refusing to strike appears to have been large. England is so thickly populated, so full of cities depending on the railways almost literally for their daily bread, that the trouble was bound to come quickly to a head, as it did. Even the strikers' families soon saw the danger of food scarcity. The method by which the settlement was so quickly reached is interesting—and in a way, simple. A single government ministry, having large statutory powers, and also having a strong motive in its desire to please an important branch of its suporters, the labor voters, promptly used two weapons: it provided ample military forces to keep order, and it promised the railways that they should be allowed to raise transportation rates to offset such increases of pay as might have to be granted. In this country both of these points would be causes of anxiety in case of a strike. The military would be a doubtful reliance, because of divided authority, of the inherent difficulties in using it and of our non-military predisposition. A promise of permission to raise rates almost materialized in our labor difficulties last year; but the trouble with that is, that even with a definite promise it may not be possible to secure great advantage from it. This, indeed, is a doubt still pending in England. The shippers will claim that industry cannot endure an advance in carrying charges, and there may be much reason in the claim. Whatever the result, the working of the conciliation board will be of universal interest, for it seems to be true that English directors have for the first time openly recognized the labor unions.

THE POLICY OF RAILWAY SINKING FUNDS.

J. WILLARD GIBBS, formerly register of bonds of the Pennsylvania Railroad, in a recent article criticises somewhat severely the general policy of American railway companies of adopting a general plan of refunding maturing bonds instead of providing for them by sinking funds started at the outset of the particular issue of bonds. His theory is the ultra-conservative one, with much on its face to commend it, that nothing so safeguards the stockholder as the carefully guarded and continuously maintained sinking fund, necessarily made from net earnings over cost of operation and regular fixed charges, including taxes and interest; that it is a constant force preserving and increasing a railway corporation's credit; and that it has a specific and emergency value in a period when railway credit might otherwise fall and when, in periods of acute depression, its resources can be used—if in cash or gilt edged securities—for profitable investment and perhaps, one may add, in retiring at a relatively low market price part of the same loan that the fund is established to take up at maturity.

No one can question the doctrinal soundness of the theory. It is, in a large sense, the application of the rule for the individual to the corporation. The wise individual owning capital, either does not run into debt at all, or if forced to do so by the conditions of his business, provides ahead for payment. He may renew his well secured notes at the bank, but his ultimate plan is their payment from profits, not by new loans. But the railway has differed from the individual at two important and fundamental points: It has been—and is—not only an everlastingly "going" concern, but a law of its life has been expansion. New properties to be acquired, new terminals to be built, new leases, new mergers to be made, have constituted a vital principle of its being and of its normal development. A great number of these liabilities will bring returns only in the more or less remote future. The question then is; shall the sinking fund be established with presumptive impairment of dividends, discontent of stockholders, and a certain lapse of credit which always follows a reduced dividend, or is reliance to be placed rather on the increased net earnings that follow wise expansion and development in due season? Is a decreased net debt or increased net earnings the major factor in railway credit, both being admittedly a positive factor?

But even if it is conceded that the theory of universal sinking funds would have been a counsel of perfection if adopted at the outset of American railroading and continued ever since, its application to present conditions becomes pretty fantastic. The capital stock of our railways in 1910 as just returned by Poor's Manual was $8,380,819,190; bonded debt and other bonded obligations combined, $10,509,941,103; or, with profit and loss net surplus subtracted $9,474,241,162. Bonded debt thus exceeded capital stock by somewhat more than $1,000,000,000. What the sinking fund requirement would be on the great bonded debt is obviously the merest guesswork, so infinite in variety are the bonded debt forms and separate amounts. But, as a broad generalization, if it called for only an annual 2 per cent., or say $188,000,000, where would it leave the $275,289,173 paid during the year as dividends on stock? The psychological condition of a good many hundreds of thousands of American railway shareholders receiving on an average about 1 per cent. in dividends, and the general effect on railway credit, may be left to the imagination. One can, of course, indulge his fancy in the opposite direction and imagine a period of wondrous railway prosperity with railway baiting and other evils of the past, and such big net earnings as would crystallize the sinking fund theory into wide practice. But the wildest optimism sees ahead no such Utopia for the railway.

The actual drift is, for better or worse, in the direction opposite to that of sinking funds—toward, as we have heretofore pointed out, great schemes of general refunding as illustrated in the Great Northern and New York Central plans. The theory that annexes to such methods and other new loans, conservated

sinking funds for liquidation of bonds at maturity will hold fast enough when it answers the question: where is the sinking fund to come from without calamitous effect on dividends? Until conditions change radically, except in the case of a very few exceptionally prosperous railways, that question must remain unanswered.

THE GROWTH OF TRAFFIC IN THE UNITED STATES.

THE summary of the statistical report for the year ending with June, 1910, given out by the Interstate Commerce Commission, shows that in that year freight transportation at last recovered from the shock caused by the industrial disturbance which suddenly arrested the progress of the country in the last half of 1907. Traffic in 1910 was greater than ever before. This does not mean that it was "satisfactory." The normal course of traffic in this country is continuous growth. If it is not greater in any year than in the previous year, it means misfortune; and if it decreases it means disaster. We had one such sudden arrest of growth in 1893, shown in the traffic of the year ending with June, 1894. Freight traffic in the three years previous had grown at an average rate of about 7 per cent. a year; but in 1893-94 it fell off no less than 14 per cent., from 93,588 to 80,335 millions of ton-miles, and it recovered slowly till 1898, when it suddenly jumped 20 per cent., as if to make up for the lost time.

The rapid growth continued till 1903, when it was 82 per cent. greater than in 1897—a tremendous growth. Then for two years it was almost stationary. but in 1905 there was a gain of nearly 7 per cent., the next year one of 16 per cent., culminating in 1906-7 with nearly 10 per cent., and reaching 236,601 millions of ton-miles—a growth of 37 per cent. in three years, and a pace that could not possibly be kept up. Freight traffic fell off the next year nearly as much as it had gained the year before, and remained stationary for still another year. The gain in 1910 was greater than in any other year of railway history, but, though 16 per cent. greater than in 1909, it was less than 8 per cent. greater than in 1907, which to an industry which had grown 37 per cent. in the three years previous seems something like stagnation. It is, however, significant in that it shows that the great increase in facilities provided before 1908 is beginning to find employment, which is further shown by the addition to equipment in 1910 of 3 per cent. in locomotives and also in freight cars.

The passenger traffic, strange to say, seems not to have been affected by the industrial depression. It has never ceased to grow and to grow fast. After the panic of 1893 travel fell off 14 per cent. in one year, and it was not till 1899 that it was as large as in 1893-94. But since 1899 it has not decreased. It gained 50 per cent. from 1899 to 1904, 26 per cent. from 1904 to 1907, and 16 2/3 per cent. from 1907 to 1910, when it was 124 per cent. greater than in 1899. The gain in 1910 was the greatest made in any one year.

The railway mileage has of course increased meanwhile, but not at all in proportion to the traffic. Witness the passenger-miles and ton-miles per mile of road at three-year intervals:

	1901.	1904.	1907.	1910.
Pass.-miles, per mile...	89,721	104,198	123,259	138,250
Ton-miles, per mile....	760,414	829,476	1,052,119	1,085,745

Actually the passenger traffic has grown more than the freight traffic in the period (54 per cent. against 43 per cent.), and it has grown much more steadily. The only sign of stagnation is that it was substantially the same in 1909 as in 1908; but it increased nearly 5 per cent. from 1907 to 1908, while freight traffic *decreased* 7.7 per cent. This is probably largely due to the fact that wages have been maintained at an unusually high figure since 1907, more so than in any other period following financial troubles.

The year covered by the last report is already a year old; but we may learn from it at least that the country has not ceased to grow, and that it recovers in time from its disasters and unwisdom. The traffic in this last year was equivalent to 346 miles of travel and a ton of freight hauled 2,733 miles for every inhabitant of the country, which can be equalled no where else in the world.

RAILWAY AND INDUSTRIAL MONOPOLIES.

THE *Springfield* (Mass.) *Republican* questions the statement recently made by the *Railway Age Gazette* that certain large industrial corporations have more nearly complete monopolies of their lines of business than is possessed by any railway or combination of railways in the United States, and that, therefore, there is as good reason for regulating them as for regulating railways. It says:

> "It has been many years since competition in through traffic has been able to break through a uniform system of rates maintained by the railways in greater or less arrangement with each other. They are necessarily monopolistic from the close restriction which must be imposed on the number of franchise grants within a given area. On the other hand, the United States Steel Corporation controls not more than 60 per cent. of the industry, has not, as yet, by any means acquired a monopoly of the country's ore supplies, and is not only exposed to large actual, but to great potential competition. . . . There is no comparison between the ordinary industrial trust and the railway as a monopolist."

These statements by a newspaper which is edited very ably, illustrates what seems to us, a widespread misconception about railway competition in this country. No doubt, the public interest requires that close restriction be imposed on the number of railway franchises granted within a given area. Both railway owners and the public are better off where there is one good railway subject to proper public control than where there are two or more parallel and competing lines which divide the business. But until recent years there was almost no restriction on the construction of parallel and competing lines; and even now such limitation exists in only a few states, such as New York and Wisconsin. There has been an inevitable tendency for parallel lines to make rates by agreement or to consolidate; but there are still in every section of the country roads that are under different financial control and management, and between which competition in the solicitation of business, in the rendering of service, and to some extent even in the fixing of rates, prevails. When two or more roads have different traffic managers there are always sure to be differences of opinion as to what rates ought to be; and in a great majority of cases the opinion of the one who thinks they should be the lowest will prevail. The rate made by parallel roads under present conditions ordinarily will be the same simply because the law requires them to be published; and there cannot be two rates or two prices in a market where rates and prices are public.

A form of railway competition which is more prevalent and more difficult to eliminate is what may be called indirect competition. If two roads tap the same points of production or reach the same markets, either with their own rails or by their connections, there is bound to be competition between them. Each of them must in its own interest protect and foster the industries of its own territory, and to do this it will constantly seek to so fix rates as to give its own producers and consumers an advantage over the producers and consumers on other roads. That is competition. The railways of Kansas compete with the railways of North Dakota in laying down wheat in the Chicago market, although they are in no sense parallel. The grain-carrying roads leading to the Gulf of Mexico compete with those leading to the Atlantic seaboard, although they are not parallel and never come in direct contact.

Finally, all the railways of the United States are exposed to vessel competition. They have to meet the rates of steamships which carry goods from Europe to the Pacific coast, of coastwise vessels, of lake steamers, and of boats on other inland waterways. They have to withstand the rivalry of the Canadian roads and canals for United States business. There is no protective tariff that safeguards the railways of

the United States from the encroachments of foreign railways or steamship lines.

If, then, the United States Steel Corporation and some other industrial concerns control even 50 per cent. of the business in their respective lines, they are nearer monopolies than any railway or combination of railways, for, clearly, no railway or combination of railways controls anything like 50 per cent. of the transportation business or could exert as much influence on rates as these industrial concerns can on prices, even if there were no regulation of rates at all. True, the railways, as a whole, might combine to raise rates, as many have in the past; but such general advances usually have not got cold before individual lines have begun rapidly making reductions here and there, with the result that in a short time most or all of the advances have been frittered away.

However, as the *Railway Age Gazette* said in the editorial which the *Springfield Republican* criticizes, it does not necessarily follow, because the business of certain large industrial corporations is "clothed with a public interest," that they should be subjected to the same kind of regulation as the railways. The kind of regulation that has been adopted for the carriers has not yet proved itself a success even as applied to them; and until it has passed the experimental stage in the railway field, it would be very unwise to extend it to others.

CAR VENTILATION

LAST winter the traveling public must have noticed a marked improvement in the ventilation of cars, especially sleepers and those provided for first-class travel. This was largely the result of the application of exhaust ventilators and the better regulation of temperature. The best general account of the state of the art of heating and ventilating passenger cars is found in a report on the subject in the proceedings of the Master Car Builders' Association for 1908. This report covers 32 pages and describes the principal systems in use at that time, but it contains little as to the relation of the quality of the air to health and comfort, beyond a quotation from the description of the Pennsylvania system of car ventilation, as developed for coaches by Dr. C. B. Dudley. The pamphlet containing this description covers 24 pages, and was published in 1904. Since that time an extensive and valuable investigation of the subject of ventilation of sleeping cars has been conducted by Dr. Thomas M. Crowder of Chicago, and the results of his work are contained in a paper presented at the annual meeting of the American Public Health Association, Milwaukee, Wis., September, 1910. This paper covers 51 pages, and is illustrated with numerous tables and diagrams. An abstract of it will be found in this issue.

The paper comprises the most complete investigation of the quality of the air in passenger cars that has ever been made, and it discusses in a most intelligent manner the requirements for good ventilation. It reaches conclusions as to the relation of the temperature of the air to its content of carbonic acid and moisture which are new, and have a direct bearing on the amount of air required for the maintenance of healthful conditions in sleeping cars.

The normal proportion of CO_2 in pure air is commonly stated as 4 parts in 10,000, and the proportions given here for various conditions will use this method of rating. The average CO_2 found in sleeping cars carrying 15 passengers and ventilated in the ordinary manner by deck sash was 7 parts in the body of the car at the breathing zone. With the deck sash open one-fourth, the CO_2 in the lower berths averaged 8.43, and in the upper berths 8.85 parts. The tests made in cars equipped with the exhaust ventilators connected to the deck sash and now generally used by the Pullman Company, gave an average CO_2 of 6.33 parts for the lower berths, and 5.95 parts for the upper berths. Where berths were occupied by two persons the average results from 35 determinations from seven cars equipped with exhaust ventilators gave 9.9 parts CO_2 in 10,000. The average hourly air supply to the berths of cars without exhaust ventilators was 1,300 cu. ft. per person, while that supplied with exhaust ventilators averaged 1,900 cu. ft. The experiments have also demonstrated that the berth is not similar to a closed compartment, but is subject to the effects of air supply and air currents through and around the curtain. Forty-three observations made in day coaches with 32 passengers gave an average of 9.38 parts C O_2.

With the car standing still the exhaust ventilators are not effective, and it was found that the contamination reached 15 parts C O_2 in cars at stations awaiting very late departures, and in a few instances it was as high as 20 parts. This should call for supplemental ventilation in the way of electric fans, not to circulate the foul air in the usual way, but arranged to either supply fresh air directly or exhaust the bad air. Open sash and open doors assist materially in this respect if the weather is not too cold. With cars in motion, it has been demonstrated that the exhaust ventilators cause an average of 40,000 cu. ft. of air per hour to enter the breathing zone of sleeping cars, and this is sufficient to afford a fair degree of ventilation for 40 persons, as it changes the air in the car ten times per hour. As the sleepers do not average 20 passengers per car, the supply is double that ordinarily supplied to well ventilated coaches.

While this investigation and most treatises on ventilation have to deal principally with the content of carbonic acid in the atmosphere, it has been demonstrated that this gas is not alone responsible for the discomfort of bad ventilation, and the closing portions of Dr. Crowder's paper deal with this interesting and important phase of the subject. A very badly ventilated room may contain 50 parts C O_2 in 10,000, but this of itself cannot have any harmful influence or toxic effect producing distressing symptoms. It is rather the exhaustion of oxygen, increase in temperature, and the larger proportion of aqueous vapor which cause discomfort. The lack of oxygen causes lassitude, and excessive temperature and vapor prevent the usual dissipation of body heat to the surrounding air. Carbonic acid, while not directly responsible for these conditions, is associated with their production, and the degree of bad ventilation generally is taken as proportional to the percentage of C O_2. The principal point is that if the temperature of the air is kept low, a larger percentage of C O_2 can be permitted in the air without discomfort. With a temperature of 64 deg. Fahr., C O_2 as high as 15 to 18 parts will not ordinarily produce discomfort. Heat stagnation is generally the cause of discomfort in cars as well as in houses, and this is the result of the physical condition of the atmosphere, quite independent of the degree of respiratory contamination or of any change in its chemical composition. The problem of properly ventilating a railway car is, therefore, chiefly a question of how to regulate its temperature. Where cars are close and stuffy the temperature is invariably high, and odors are then more noticeable.

The overheating of cars is the paramount evil to be guarded against in the attempt to maintain comfort and good hygiene. In sleeping cars it is necessary to have twice as large a proportion of radiating surface as is usually required for heating residences, as the number of persons occupying a given space is much larger and the air must be changed more frequently. A system is therefore needed for cars which is capable of being quickly controlled to meet rapidly changing conditions. Such a system, with multiple units of radiating surface, each with a separate control, is now being used experimentally. It is encouraging and a great satisfaction to find that conditions in sleeping cars are tending toward an ample supply of fresh air at a uniform temperature of about 60 deg., and this is almost equal to that in a comfortable bedroom in a residence.

This much accomplished, attention should be directed to the ventilation of coaches, where conditions are even more difficult, on account of the more crowded space, and where the great majority of railway passengers are still suffering from overheating of the cars and bad ventilation generally.

Letters to the Editor.

PHYSICAL EXAMINATION OF EMPLOYEES.

Boston, August 19, 1911.

To the Editor of the Railway Age Gazette:

I have read with interest your editorial of this week on the Bridgeport derailment. While your title contains the word "discipline," and while the salient features of discipline are dealt with in a comprehensive manner, you touch but lightly on the question to the health of engineers and firemen, which is an important element in discipline. It seems to me that this point should receive much more emphasis than it usually does. You say that it would be an extreme course to examine enginemen daily. This may be so; but surely every man ought to be examined by a competent authority after having been absent from his duties for a considerable time on account of sickness. I understand that on the New Haven road there is no regulation requiring this; and, in fact, that the examination for eyesight is about the only test that is in regular use on that road. In the case of Curtis, none of the reports indicate that anyone but himself was responsible for the decision that he was well and able to satisfactorily assume his duities when he came back to work.

Firemen, flagmen and others on whose vigilance the safety of trains depends, ought also to be examined. We do not so often hear of cases of heart disease or apoplexy among firemen and flagmen; mainly, I suppose, because they are usually younger than enginemen, and also because a failure on their part is not so likely to make trouble; but surely in formulating any scheme of discipline, according to the high standards which you set forth as desirable and necessary, these other ciasses ought to receive due consideration. FOREMAN.

GENERAL MANAGERS AND DISCIPLINE.

Philadelphia, August 21, 1911.

To the Editor of the Railway Age Gazette:

I have been reading your article of last week in which you discuss the remedy for such failures of engineman as caused the wreck at Bridgeport, Conn., in July. I feel quite sure that railway officers generally will agree with you that there is room for a great "jacking up" in the discipline of both engineers and firemen. This difficult problem of discipline, with grievance committees devoting their nights and days to a study of the best way to get around the officers with whom they have to deal, and constantly planning, in conjunction with the higher officers of the unions, to make regular and frequent attacks all along the line, from the trainmaster through the different officers up to the president, or as high as they can go, is, indeed, a perpetual burden and one which only the most energetic and persisten' railway officer can adequately cope with.

But do you not bear down with excessive severity on the division superintendent? Your list of questions, printed in fine type, must surely appeal to all practical railway officers—especially if one reads between the lines—as touching on most vital points; but are you not assuming a good deal, in your introductory paragraph, in putting those questions into the mouth of the general manager? It has been my observation that the general managers do not do much in the way of asking questions of this kind. Loaded down with other duties, they leave discipline to the officers below them. And yet, with the mammoth railway system of today what is more necessary than this constant calling to account from headquarters? A half dozen superintendents are sure to fall far short of pursuing a uniform policy, and the general manager (or general superintendent) is in duty bound to constantly watch the discipline in order to avoid inconsistencies. The unions insist on dealing with a high officer. They have to do this to brace up their own dignity. The high officer cannot administer all discipline, but he can at least study the conduct of all his superintendents; and if he does that with a determination to deal with the enginemen fairly he will see that those questions of yours are not only asked, as often as necessary, but also that they are properly answered.

On the main point, that reasonable energy in administering discipline will produce a high degree of efficiency on engines and nearly or quite abolish our disgraceful smash-up record all railway officers must agree. G. H.

DISCIPLINE OF ENGINEMEN.

To the Editor of the Railway Age Gazette:

Your editorials of August 11 on the Batavia accident, and the 18th on the Bridgeport case are well timed and to the point, especially in view of the more recent Fort Wayne accident. In the solution of this subject both the managements and the men responsible for the safety of railway operation are confronted with a task which must be quickly and rightly solved if they hope to escape indictment at the bar of a stern public opinion which will define and enforce with a strong arm the law of the land enacted for criminally negligent offenders.

Under present conditions with the power of control over operation and discipline circumscribed by the men, it is but natural that the manager who has a bargain to drive in the interest of his business should make certain concessions in the requirements of the service not necessarily jeopardizing its safety; but a concession, any concession, serves as the entering wedge for other and more drastic demands from the men until finally the employees in the engine and train service become mere automatons, performing in a grudging, perfunctory way only the service actually defined in their agreement. This, as you know, has been the result on many roads.

The last part of your last editorial, referring to the fireman's function as a monitor, strikes a vital point. Until the advent of organization agreements it was never contended on live, actively managed railways that firemen could not see and call signals to their enginemen; and a thorough, exacting investigation of this subject now by disinterested, competent authorities would conclusively demonstrate the unreasonableness of this claim. And this monstrous assumption that a fireman cannot find time to observe signals is virtually incorporated into most of the rules for firemen, in the clause that they shall observe . . . when not otherwise engaged. I have made many trips on locomotives of fast passenger and freight trains, and have yet to find the first fireman who did not see and call every signal to his engineman at the proper time. The difficulty of seeing signals through smoke is a false issue. The black smoke nuisance very quickly disappears when effective measures are employed to require firemen to fire properly.

What good is accomplished by preaching co-operation from the house-tops when the engineman and fireman take refuge behind the bulwark of their organization agreement and refuse to be dislodged from their stronghold, either in the interest of safety to the public to themselves or to their co-employees?

On many roads there are still among the employees a fair proportion of men of the old school who by their precept and example exert a healthy influence for good upon all with whom they come in contact. Unfortunately these conservatives are growing fewer each day, while the upstart who knows by heart every article in his agreement before he learns the A B C of his rules is out-talking and out-voting the better class in every issue involving the general welfare of all.

A situation such as I have outlined is only too familiar to railway officers generally. There are, however, occasional rays of light among the clouds. On roads where the management has given due attention to the matter the personnel of the employees' committees is changing from the rabid agitator with few good qualities except ingenuity, to the conservative, level headed

man who has the ability to analyze each case brought to his attention, and the courage to speak his mind fairly and freely upon every issue. The slogan that it is easier to keep out of trouble than it is to get out of it, is being appreciated, and officers are drilling it into the minds of the men, with the result that there is upon some roads a marked reduction in the demerit record from year to year, with a correspondingly increased efficiency in the service.

Effective discipline is the keystone of safe operation. Under the organization of most roads the superintendent is made directly responsible for the discipline of the forces employed on and running over his division. But with the constantly growing right of appeal from the decision of the superintendent to the highest officer, and the almost constant activity of the paid general chairmen and committees of the various organizations the superintendent has a perplexing task. He is told, perhaps not in so many words, that he must keep the committees away from the general office. General managers who ask those searching questions which you print in fine type, and which, evidently, are framed to support, not undermine, the superintendent are few and far between. Most superintendents will think not only your questions but your general managers are imaginary.

On a busy division the superintendent is required to devote a considerable part of his time to a discussion of the merits of his discipline with the committees. No matter how diligent he has been in ascertaining all the facts of a case, or how careful he has been to analyze them; nor what justification he may have for the infliction of discipline; he is still confronted with the appeal, and is told by the committee that their men disagree with him. By and by, either directly or indirectly, the appeal reaches the top, with the chances in favor of a reversal or modification of the superintendent's decision, based on the statement of the committee that a reversal would have a good effect on the men and that they (the committee) would see that the offense did not occur again. A victory in one case is followed by a demand in another and so on until almost every decision by the superintendent is reviewed by his superiors.

Until the advent of the 16-hour law enginemen and firemen were frequently worked long hours. This, together with the defects of the old type of signals and their liability to give incorrect indications frequently justified clemency in the discipline for signal violations. But the science of railway signaling has advanced so that signals do not fail, except on the side of safety; distant signals are located in the rear of home signals, more than the full braking distance for the highest authorized speed, and men are not overworked; they are given as much more than the legal stipulated hours of rest as they request. Notwithstanding all this, collisions and derailments from the disregard of signals continue. Enginemen expatiate on their multifarious responsibilities. Is there a practical railway man who will soberly claim that an engineman with signals definitely located and uniform in character, and with air brakes to control the train at his fingers' end, has more to do now than he did twenty years ago? Then signals were irregularly placed, hand brakes were his dependence for control, and he was required to keep his eyes constantly glued on the track ahead expecting a flagman at any point. The complete disregard of a flagman by an engineman was then a rare occurrence. Now both flagmen and signals are sometimes disregarded. What can be plainer than that our first need is a great infusion of care, vigilance and a sober devotion to duty?

Suppose Congress in its wisdom should direct the placing of a third man on all locomotives of passenger trains. Congressmen are elected by the people, and every fireman and his friends have votes; the Congressman likes Washington and wants to stay there. It is almost an even break, if such a law were passed, that inside of six months these lookouts would be brought under the protection of one or both the enginemen's and the firemen's agreements; and the positions would be filled by superannuated enginemen or firemen. The poor superintendent will then have the testimony of three witnesses (provided they still live), instead of two, who will swear that the signal was clear. What guarantee will Congress give that the lookout will stay awake; that he will take his rest when off duty, or that he will refrain from going on duty when he is not physically and mentally fit for the task before him?

That our discipline is full of holes is strongly indicated by the fact that enginemen get sleepy and run off derails, disregarding the signals protecting them. Automatic stops have their place, but at best they are not foolproof and lack the element of flexibility absolutely essential to the operation of a steam railway handling all classes of traffic.

Should the locomotive engineman intrusted with the lives of passengers not be held to the same degree of accountability as the doctor for the lives of his patients? The automobile chauffeur, the street car motorman or the driver of a team who accidentally runs down a person on the street is arrested and made to prove his innocence or to show that the accident was unavoidable. The locomotive engineman disregards a fixed signal indicating stop, without knowing it, until something happens, or until he is called upon for an explanation. If some one is killed or badly injured he is dismissed or suspended. The inquest is held and a show made of placing the responsibility, but frequently without the slightest rational regard for the merits of the case from a railway standpoint. The authorities need votes, the matter dies out, the engineman is reinstated with his rights of seniority, and he goes back to the throttle. In the eyes of his fellow employees he is vindicated and he is exonerated by the easy going prosecuting attorney.

The real trouble with the discipline of most roads is not in its plan or scope, but simply that it is weak. Punishment is inflicted by the division superintendent or his subordinate, "because he has the authority." It is reversed by the executive officer because he lacks the something necessary to straighten out his superintendent or get a new one. Real straight-from-the-shoulder discipline backed by a common sense application of the rules will stay put if the railways will have it so. This, combined with an energetic application of the law for the criminally negligent offender will do more to make railway travel safe than all the fool-proof "safety devices" in the patent office.

Why is it that Congress and state law-making bodies have taken such a keen interest in the welfare of the employee and allowed the public to suffer at the hands of the negligent employee? The automatic coupler law, the air-brake law, and others have been passed and enforced at the expense of millions of dollars, all in the interest of the employee. Every road in the country is covered by inspectors from the state and interstate commissions, searching out the slightest violations of the above mentioned laws on the part of the companies; but has any one ever heard of one of these inspectors calling attention to violations of the operating rules on the part of trainmen or to dangerous practices coming within their observation? The public is paying the bill; why not make these inspectors and their high priced commissions of some real value to the public in the interest of greater safety to passengers?

Suppose Congress should start something by enacting a law empowering the interstate commerce commission to review all signal violations on the part of enginemen or trainmen, and providing that no employee disciplined for violation or disregard of signal indications should have his sentence mitigated without government approval. The commission disciplines the railway for every infraction of law brought to its attention. Every employee in the train or engine service is a detective serving the government for nothing by reporting violations coming within his observation; yet refusing to give the same information to his division superintendent, or immediate superior, on the ground that he doesn't want to be a "sucker."

Not infrequently serious accidents are caused by negligence of employees, the cause of which is so carefully covered up by all concerned that the superintendent experiences extreme difficulty in ferretting out the culprit. What better argument could

be asked for in favor of government control over discipline than to refer to the operations of floating craft in New York harbor. The captain and chief engineer obtain their licenses from the Board of Harbor Supervisors. This board has the power to investigate accidents and suspend or revoke licenses, and it is more feared by the captains and chief engineers than the combined discipline of all the employers. Their employers can dismiss them, but so long as they retain their licenses they can obtain employment elsewhere. But once their licenses are revoked their occupation is gone. Herein lies the effectiveness of discipline as applied to marine operations. Similarly applied to steam railway operation it would create that moral awaking on the part of officers and men which is absolutely necessary to safe operation.

L. N. S.

TRAINMEN AND SAFETY APPLIANCES.

ST. LOUIS, August 16, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

It will be recalled that T. H. Curtis, president of the Master Car Builders' Association, in his address at the annual convention, June 19, speaking of defective safety appliances, showed that as to couplers and uncoupling devices . . . over 2,000 out of 5,000 defects reported could have been righted within an average of one-half hour's time for each defect; and that as to air brakes of the 16,000 cases reported, 10,000 could have been repaired by detaining the car from service only one-half day, at the most, and these repairs would have required only labor. The greater part of the defects mentioned would have been obviated by greater care and supervision. In other words the labor and material cost necessary to correct the defects was practically negligible.

When we take into consideration the limit of time at the disposal of the inspectors, or the difficulties under which most of the inspections are made, we have cause to congratulate ourselves on the fact that the showing made is as good as it is, and that more defects are not overlooked.

As the laws applicable to safety appliances are now more stringent than in the past, it is fair to assume that even greater vigilance will be necessary on the part of the inspectors. The time allotted to the inspection of trains, especially fast through freight at intermediate terminals is limited, and with inspectors at these points to examine and test every hand-hold, grab iron, ladder iron, sill step, release rod, running board, etc., the conditions will necessarily entail either a large increase in the number of men employed, or an unreasonably long detention of cars. But it would be almost impossible to keep the number of inspectors necessary continuously employed at other work when there are no trains passing to be inspected, and an insufficient force would result in endless complaints from shippers. Every car having any one of the numerous safety appliances defective carries with it the possibility of a penalty assessed against the road; so the railways truly are placed between horns of a dilemma.

In view of the present state of train control, involving so little time and effort on the part of trainmen, why would it not be possible for us (the transportation department), to co-operate with the mechanical department in these matters to the advantage of both? With the introduction of automatic couplers, air brakes, block signals, etc., the trainman's work has been reduced to the minimum, and time must necessarily hang heavy on his hands when going over the road; time flies with a busy man. This thought has fostered the idea that if we required the trainmen to inspect and report on safety appliances enroute, we should not only relieve the mechanical department, and expedite the movement of trains through terminals, but confer a real benefit on the trainmen themselves.

The duties of the trainmen necessarily carry them over the entire train with more or less frequency during the entire trip. The idle time at their disposal is ample, especially where, by law, we are required to carry more trainmen than are actually necessary. Therefore why not have the trainmen inspect for defective safety appliances, and bring their trains to terminals thoroughly inspected with every defective car properly carded? Then the terminal car inspectors could proceed to make the necessary repairs immediately upon arrival, instead of first holding the train for inspection and then again having to delay the train to repair the defects found.

The trainmen certainly are in better position to detect any defective safety appliances than any other employee connected with train operation, coming as they do directly in daily contact with them, and having the entire train absolutely under their personal supervision for hours at a time. They could soon learn to familiarize themselves with the commission's requirements, so as to be able to report correctly on all matters. The conductor's record of cars handled would afford absolute check on any negligence where an incoming crew failed to report defects which were afterward discovered by others.

Of course there may possibly be objections raised on the part of the trainmen; yet, as the safety appliances are placed on cars for no other purpose than increased safety for the trainmen, why should they not be more interested in their proper maintenance than anyone else? And why should they not render every possible assistance with this end in view, especially as it will entail so little extra labor on their part as to be hardly worth considering? We might fairly claim that the work is directly in line with their full duty. On many roads, conductors are now required to fill out cards for defective or inoperative air brakes found enroute; why not include all other safety appliances?

R. P. F.

COLLEGE MEN AND RAILWAY WORK.

NEW YORK, August 4, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The letter of "Yale 1894" in today's issue gives good advice to the engineering graduate wavering after a year or two in railway work, but the average beginner will not turn down the more alluring pay and privileges in other lines for the railways' dim prospects. He does not claim wonderful ability, and he knows he may never arrive.

The writer passed safely through the first stages, and attained the confidence of his superiors. But he kept his eyes open, and noted glaring flaws in the theory that the best man wins. He saw poor men unloaded on other offices at increased salaries, while the good ones remained at their old pay. He saw a man barred from promotion because he alone in the office was familiar with a certain piece of work. For several years he was under a favorite whose office drew plums galore. To get more varied experience he secured a transfer to an unpopular office. The educational advantage did not balance the political disadvantage. The salary scale was 20 per cent. lower. A financial scare came, and his new office was bisected on a two days' notice, one of the victims being an elderly full member of the American Society who had served the road faithfully several years. Apparently no effort was made to place them in the popular office, which suffered no cut at all, though overrun with green men. The writer was not cut off, but he did not wait for the next time.

On our greatest railway, it is generally understood that if a man lives long enough he will get credit for his ability, and your biographies of its higher officials usually show continuous service with the one road. But most of your other biographies show frequent shifts in the early years. Why? Because the man could not get the recognition he knew he deserved. Other capable men are too poor, too timid, or perhaps too loyal to shift, and they never get recognition. The young graduate does not know all this, but the brighter he is the sooner he guesses it, and unless the fascination of the railway has a firm grip, he tries something else.

1903.

THE PEKING-KALGAN RAILWAY; CHINA'S MOST DIFFICULT PIECE OF CONSTRUCTION.

BY LEWIS R. FREEMAN.

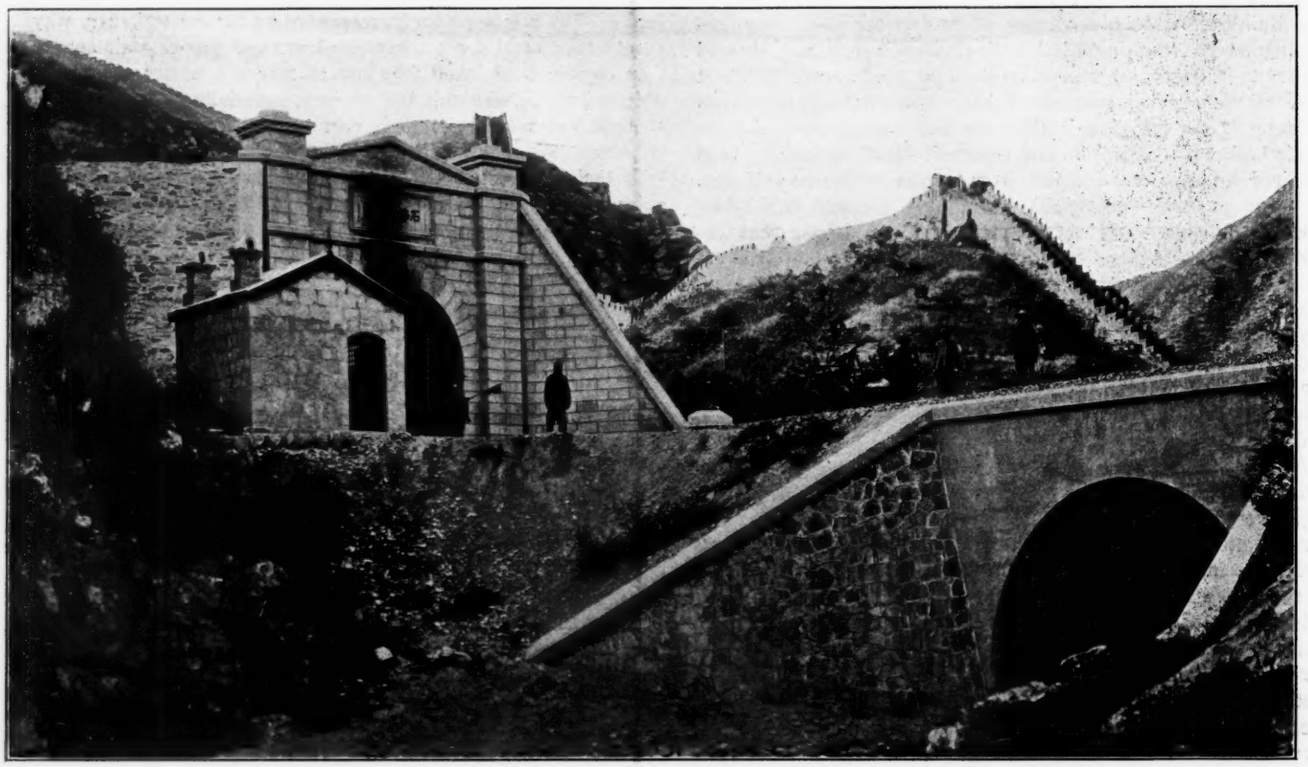
It is a fortunate circumstance for the Chinese in their contention for the full supervision of the expenditures of all railway loans from foreign syndicates, that the Imperial Peking-Kalgan Railway, which up to this time stands as the most difficult venture of its kind yet attempted in China should have been financed, engineered and built solely by Chinese. Of even greater importance in support of this contention is the fact that this road has set a record for low cost of construction which, all things considered, has seldom been equalled.

The Peking-Kalgan Railway runs from the capital of the Empire to the chief city on the caravan route to Russia. It is now 130 miles long and is being extended. It was built from the surplus earnings of the government-owned Imperial railways of North China, and from the first reconoissance to the driving of the last spike no foreigner had anything to do with its construction. To-day its operation is entirely in the hands of the Chinese. That it was built in spite of natural obstacles to construction which foreign experts declared were absolutely prohibitive to any Chinese engineer and possibly even to themselves, is a personal triumph of no mean magnitude for the chief engineer, Jeme-Tien-Yu. That it was built at a cost almost without parallel for similar construction—at a lower figure per mile even than some of the foreign-built roads on the level floor of the Yangtse valley—is a striking object lesson for Europe and America, and will be a powerful weapon for the Chinese in their contention for fairer terms in borrowing foreign money. The road is now operating at a profit, so the directors of the Imperial Railways of North China have succeeded not only in providing their government with a line that is strategically valuable, but with one that earns a return on the money invested. From first to last, from whatever viewpoint it is regarded, the Peking-Kalgan line is a great triumph for the Chinese.

The name of Jeme-Tien-Yu stands out above all others in the record of the Peking-Kalgan Railway, and his achievements in connection with that enterprise alone are sufficient to have won him the undisputed title of China's leading engineer. He was one of a number of Chinese students who were sent to America about 1880 to receive university educations. Jeme-Tien-Yu was the only one who undertook a course in engineering. He graduated from Yale in 1883, and then went to a technical school in England for several years. On his return home he went into the employment of the Imperial Railways of North China, where, working under the able British manager of that line, C. W. Kinder, he rose post by post, outstripping many foreigners who were senior to him in point of service. Later he was appointed chief engineer of the Peking-Kalgan line.

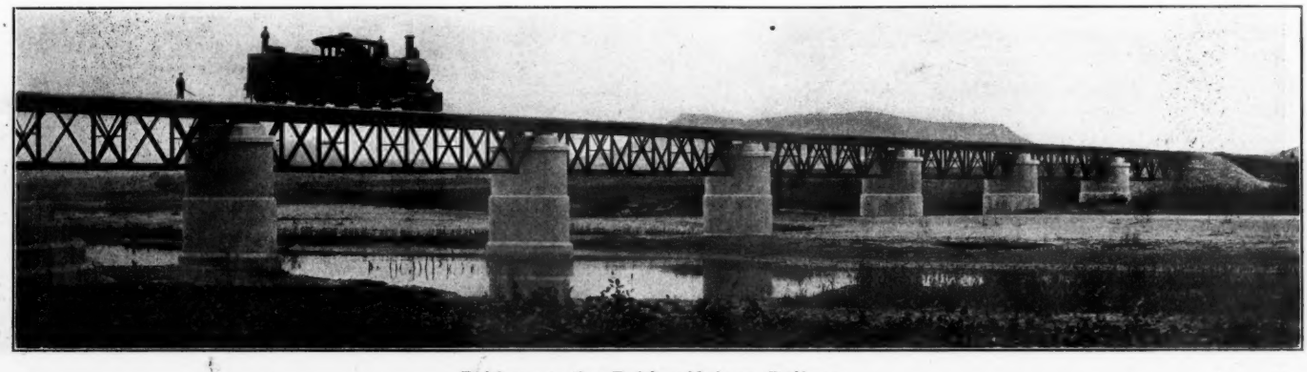
Preliminary surveys for this line were made in the summer of 1905 and construction work was begun in October of the same year. At the end of nine months the first section of the road, 32 miles long and reaching to the mouth of the Nankow pass, was completed. Chinese were employed in every department, from the lowest coolie or camel-driver up to the chief himself. The saving of the salaries of high-priced foreign officials, interpreters and various middle men became apparent at once. An even greater saving was found in procuring earthwork and similar constructive materials directly from petty contractors along the line, instead of giving the contract to big contractors and then paying all the commissions necessary in their system of subletting and re-subletting contracts. This practice is not confined to China, but is carried to greater lengths there than anywhere else, and its abuse has been responsible for the great expense of so much work done by foreign syndicates in that country. For earthworth on this first division of the Kalgan line the average cost was about two cents per cubic yard; while after the Nankow pass was reached and the embankments had to be made out of broken boulders, the cost rose to three cents a cubic yard. Broken stone for concrete was purchased for from 13 to 33 cents a cubic yard, delivered ready for use, and sand for the same purpose averaged about three cents a yard.

Most of this section of the road runs over flat plain, gradually sloping to the mountains. The Peking station is at Liutsin, a short distance outside of the great wall of the capital, as very



Tunnel, Culvert and Section of Great Wall.

few Chinese railways penetrate the walls of any of the old cities, both on account of the lack of space inside and because of the violent prejudices of the conservative element of the people against such desecration. For some distance the line runs through a fertile farming country dotted with small villages. The most striking feature of this part of the journey is Waushoushan, the $50,000,000 summer palace of the old Empress Dowager, with its roofs of Imperial yellow tile standing out strikingly against the green hillside upon which it stands. Shortly the country commences to show traces of erosive wash from the mountains, and before long the crossing of numerous cuts and arroyos of gravel and boulders begins. The bridges are all solidly built of steel and concrete, and the largest of them is nearly 300 ft. long, having five 30 ft. spans and one of



Bridge on the Peking-Kalgan Railway.

110 ft. The steel superstructure of this bridge—with the exception of the long span, which was supplied from England—as well as of all the other bridges on the line, was built in the shops of a Chinese concern at Shanhaikuan.

This Liutsin section of the road has a total of 21 bridges and 17 drains, aggregating 1,352 linear feet of openings. All of these constructions are of steel and concrete and bear every stamp of strength and permanency.

At Nankow are quarters for employees, machine shops, locomotive sheds and numerous other railway buildings of excellent construction. There is an up-to-date foundry in connection with the machine shop, where castings of any size required in locomotive and car-repairing can be made. A well-equipped hotel, built and managed by the railway, fills a long felt want of tourists.

The Nankow pass section, the most difficult piece of railway engineering in China, was the next portion of the road to be built. This pass must have presented a very discouraging aspect to the Chinese engineer when, with the honor of his country at stake and with the "inevitable" failure, prophesied by all the foreign engineers in the East staring him in the face, he started over it for his first tentative study. There is a rise of 1,800 feet in the ten miles from the mouth of the pass to the summit at Pataling, and the gorge is so narrow that it seemed almost impossible in places to keep the necessary curvature without tearing down the mountain. Five distinct surveys were run, and on the earlier ones some of the curves were sharp enough to "break the back of a snake," as Mr. Jeme-Tien-Yu stated it.

Slowly, and with infinite pains, a practicable line was determined upon, and along this the present road has been built. Even the most exhaustive surveying, however, could not solve all of the problems, and at a point not far from the summit tunnel, where it was necessary to have a station and sidings, a switch-back was introduced. However, a station being necessary, the inconvenience of the switch-back is minimized.

The general direction of the railway up the pass is about parallel to that of the old stone-paved highway which leads down to Peking from the plains of Mongolia, the road over which all the Tartar invasions of the Chinese empire have come since the time of Ghengis Khan. The general aspect of the country, in its rockiness and lack of heavy vegetation, is strongly suggestive of some of the lower reaches of the more northerly passes of the Chilean Andes in South America. The railway up the pass is one continuous succession of cuts, fills and tunnels. The fills, regardless of their height, are for miles faced with cut and fitted

Curve on the Kimingyih Division; Cut Stone Used to Prevent Erosion; Grass Planted on Bank.

granite blocks. All the overhanging boulders have been removed, or securely cemented into place even for hundreds of yards up the mountainsides, while the solid rock of the cuts is trimmed as smoothly and evenly as if lined with plaster. The 19 bridges and the 36 culverts are all steel, concrete or cut stone, and in many instances where swift mountain torrents are crossed

Bridge at Entrance of Nankow Pass; Mongol Herders with Goats and Ponies.

cemented beds for the water have been laid to prevent undermining.

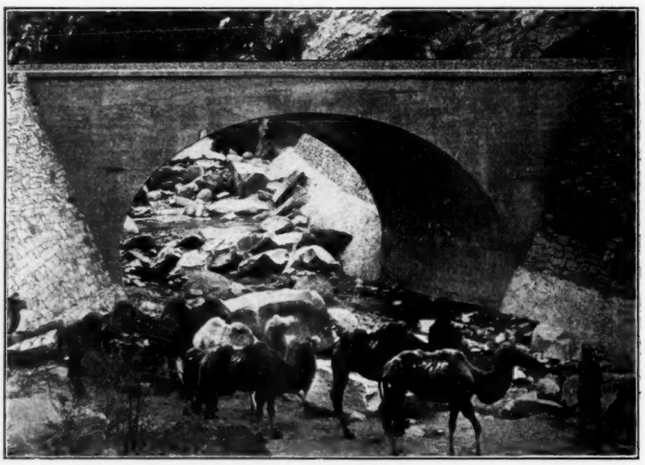
The tunnels of this division are four in number, their respective lengths, in order as approached from below, being 1,200 ft., 150 ft., 450 ft., and 3,570 ft. The first tunnel which was driven through limestone was completed in about six months. The other three tunnels, all of which are in granite, were completed in good time. The one at the summit, the longest in China, took over a year.

The summit tunnel, which runs under the Great Wall, was driven according to thoroughly up-to-date practice. A shaft was sunk near the half-way point, and with the aid of fans, drilling machines and modern hoisting apparatus, work was carried on in both directions from the center, as well as from the ends of the tunnel. This shaft, with another which was sunk to admit air near the northern portal of the tunnel, have since been lined with stone and retained as permanent ventilators. All of the tunnels are lined throughout with concrete, which is also used for the portals.

The open cutting in the pass, half of which is in solid rock, amounted to 640,000 cubic yards, while the fills required an aggregate of 1,275,000 cubic yards of material. The latter, except such as was provided from the cuts, was obtained cheaply by blasting it out of the nearby mountainsides. The labor for all of this earthwork cost only $220,000.

The third or Chatao-Kimingyh division, 38 miles long, was of comparatively easy construction. There are 17 bridges and 32 drains—in all 2,662 ft. of linear openings. The principal engineering feature is a 1,000-ft. bridge having ten 100-ft. spans at Huilahsun.

The fourth or Kimingyh-Kalgan division is also 38 miles long,



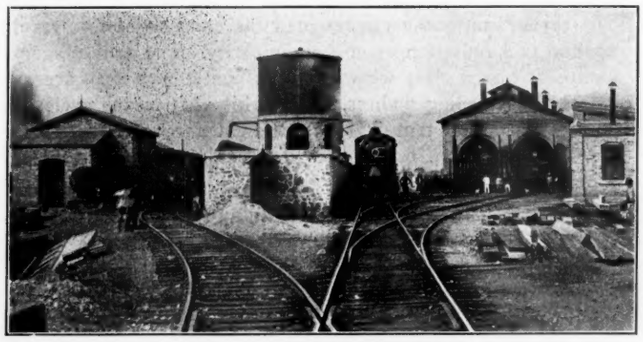
Typical Bridge Over Mountain Torrent; Camels Thrown Out of Business.

and in engineering difficulties rivals that of Nankow pass. At Hsiangshupo 16,500 ft. of granite and sandstone have been cut through to make a way for the road along the steep bank of the Yangho, the cut varying from 10 ft. to 85 ft. deep. There are 2,075 linear feet of openings, 21 bridges and 130 drains.

Switchback in Nankow Pass; Peking-Kalgan Railway.

At Kimingyh the company is operating a coal mine of its own, and the installation of a thoroughly modern plant promises to soon provide fuel for all its needs. A 15-mile branch to the Mentoken coal fields gives the excellent product of those mines an outlet to the Peking market.

Of the character of the roadbed of this splendidly-built line the photographs give a very good idea. The ties are mainly of Japanese hard wood of a class which would cost in the vicinity of a dollar in the United States, but which are laid down in China for less than half that figure. On the mountain divisions creosoted ties are used, with provisions to prevent rail creeping.

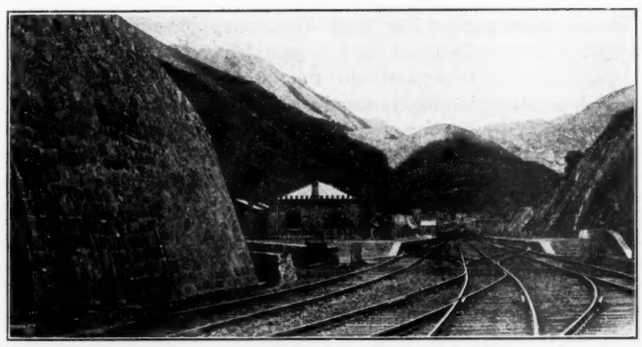


Tank, Engine House and Shops at Division Terminus.

For the main line, which is of standard gage, 85-lb. rails are used; for sidings and branches, 60-lb. rails.

The locomotives for the mountain divisions of the line are mostly Mallet articulated compound. Such of the passenger cars as have not come from the shops of the Imperial Railways of North China at Tongshan are of American manufacture, but the company will doubtless build all of its own cars in future. The China-made cars are of a modified British type, a sort of a compromise between a side-door compartment car and one of the center-aisle type. The third class cars, for which the fares are amazingly low, are hardly more than open-sided freight cars with benches along the sides. The freight cars of all classes are of 30-ton capacity, with two trucks.

The following two paragraphs were taken from an article on the Peking-Kalgan Railway which appeared in *The Chinese*



Station in Mountains, Nankow Pass; Retaining Wall to Support Crumbling Ledge.

Students Journal. They make a strong plea for full control of expenditures in railway construction by the Chinese.

"In the construction of a railway, economy, which must not be confounded with cheapness, must always be kept in view. All railways which have been built, and are being built, in China must be paid for by our people, and our people are poor. A railway line is not a clubhouse or a private mansion upon which the owner or owners may expend millions merely for the gratification of their sense of beauty or for an exhibition of their wealth, but is a commercial investment. The amount of capital invested in it must be commensurate with its power of paying dividends, and in the case of Chinese railways the redemption of the bonds must not for a moment be forgotten. Economy on the Peking-Kalgan Railway has been reduced almost to a science. There is no temptation to spend money recklessly, as no five per cent. commission on every tael spent can enrich the coffers of any corporation. There are no engineers who must have foreign style residences, cement tennis courts, ice-making machines, palatial house-boats and princely salaries before beginning work. There are no interpreters to browbeat the contractors, to make trouble with the local officials, and to make a fortune in little or no time. All contractors deal with the engineers directly, and no graft exists. The figures for the price of materials explain in a large part why a railway built under our own supervision and by our own engineers is so very much more economical.

"Another very important advantage gained is the peaceful condition of the coolies during construction, due to the absence of misunderstanding between engineers, the coolies and the country people. No disturbance of any kind, still less of any rioting, has ever happened, and the work has proceeded so smoothly and quietly that the local officials are never called upon to suppress disorders or punish offenders. There can be no unpleasantness arising through the interfering of foreign consuls and the referring of insignificant incidents to the ministers in Peking. One and all understand that the railway is a Chinese railway, that our own money is being spent, that the coolies are our own people, though they are coolies, that the officials are officials appointed by the Emperor, and the result is that the work proceeds without a hitch of any kind."

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

XIII.

Chicago, July 1, 1911.

My Dear Boy: One of the easiest things to measure, because definite in terms and limited in quantity, is money. The things which money may represent are hard to measure because often intangible and indefinite. The money account may or may not reflect efficiency in performance. Have we not been grasping at the shadow of money at the expense of the substance, effect? Consider, if you please, the working of a bank, perhaps the corporate institution in whose efficiency the public has the greatest confidence. In a small country bank one man does all the work. Later he requires a clerk or a bookkeeper. As the bank grows there are self-suggesting divisions of labor along such well defined positions as teller, paying or receiving, cashier, vice-president, president, etc. In the first place, the same man handles the money and its written representations, the accounts. When we reach the stage of having both a teller and a bookkeeper the one is a check on the other, because of a difference in point of view. I do not understand that a bank considers its bookkeepers more honest than its tellers or vice versa. The bookkeeper came along to check the teller, not because of such marked variations in humanity, but because of the volume of business. There was more than one man could do.

The large corporations, including the railways, seem to have followed governments into a fundamental fallacy in the matter of money and accounting. Because, now and then, in spite of safeguards, a trust is violated and money embezzled a remedy is sought by segregating in administration all activities having to do directly with fiscal affairs. The ultimate effect is dwarfing to administration and fatal to maximum composite efficiency. In a compact establishment like a department store or a large manufacturing plant, the closer contact of the departments concerned minimizes the evils of this segregation. The operations of a government or of a railway extend over so much territory that such close contact is impossible. The result is that our bookkeeper is too far away from the paying teller. The bookkeeper then arrogates to himself fancied qualities of a superior

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being blessed with a rectitude born of the guardianship of money. Yes, we must have the transactions of one man checked by another more or less disinterested. This is not alone a question of integrity, but concerns the failings of the human mind. The more conscientious and careful the engineer the more does he desire a check on his own calculations by competent persons. We accept the estimates of the engineer, swallow them whole sometimes. We tell him to go ahead and blow in the company's money or credit to accomplish a desired result. This is because we have confidence in his professional ability. When it comes to one of the components of his constructing work, the disbursement of real money, a lay function, we balk. We say to him, this is so different that your vouchers and checks are worthless until mulled over by a distant circumlocution office. This office, it is true, has no first hand, practical knowledge of what you are doing, but because this is money we feel safer by imposing such a check. But when the bookkeeper sat in the same room, like a bank, and checked the engineer, this was a good working hypothesis. Did we not outgrow it long ago? We trust the engineer to hire a thousand men, to incur a legal obligation for us to pay them. Why send the pay-rolls several hundred miles to be checked by a lot of boys? Why not let the engineer disburse, subject to a real check, after the fact, by a competent disinterested inspection of his work?

The same general line of reasoning applies to all the activities of a railway. We endeavor to insure integrity by disbursing only through the central offices of the auditor and the treasurer. By the same reasoning a large bank would keep its customers waiting at one window because only one teller would be allowed to pay out money. A bank can count its cash at the end of a day, but it can never tell exactly what remittances its correspondents have in the mail. A railway's money is even more in a state of unstable equilibrium. All night long some of its ticket offices and lunch counters are open. All night long cash fares are being collected on trains. The exact amount of money on hand at a given moment is only an approximation. This is natural from the characteristics of a railway. It would be a hard matter to stop every train and determine the exact location of every freight car, at home or earning per diem, at any particular moment of time. We can, however, approximate sufficiently closely to the conditions to serve all practical purposes.

Tremble not at my coming, Clarice; I would not push the auditor off the pier. Rather would I put him on the band wagon and let him blow a bigger horn. Is not accounting one of several components of operation of which collection and disbursement are yet others? Why not frankly admit that a railway is too unlike a department store to put all the cashiers and bookkeepers on a single floor? Why not interweave accounting with operation? Why not make such operating units self contained, as experience may prove wise and practicable? Some of the best roads in the country now have division accounting bureaus in order that the superintendent may keep his operating expenses in hand. The next step must be a division disbursing officer. A pay-roll and certain kinds of vouchers, including some for claims, must become cash without the worthless certification of the general office.

Returning once more to the bank for inspiration and for light, do the bookkeepers of a chain of associated banks report to a head bookkeeper in a central office in a distant city? No, each bank is a self contained unit under the president or a manager. The policy is dictated, the methods are prescribed by a central authority. Efficiency, integrity, and uniformity are insured by inspections and audits by competent experts free from local affiliations.

What is going to become of the accounting department? Why, the accounting department is going to be absorbed by the operating department. From the ashes of the ruins there will arise a department of inspection or efficiency which will do the things that the so-called auditors are now helpless to accomplish. Some of the men in this new department will be recruited from the earnest officials and clerks of the accounting department of today. These men fail to attain the result they so loyally desire, not from their own limitations, but from the fallacy of the system under which they work. They deal with accounts—mere symbols; with money a representative. Their work, to be effective, must deal with things, and above all with men. Audit is extremely important, but not all-important. Audit is a component part of a larger activity, inspection. The word inspection on railways is unfortunately and improperly associated with the thought of secret service and underhanded spotting. True inspection is as open as the day and as welcome as the evening. The earlier station agents resented the creation of the traveling auditor as a reflection upon their integrity. The station agent of today—and as a class what splendid, honest men they are—welcomes the traveling auditor, because his visit means a clearance The public accountant had a long fight for recognition of his legitimate function, first in England and later in this country. Today he is established and desired by the general accounting officers of railway corporations.

Following the public accountant comes the efficiency engineer. While one inspects conditions, the other audits accounts. By an easy process of evolution the two positions sooner or later merge into one. The volume of business may warrant a segregation, however, into component activities. Sooner or later the final certificate must include inspection of men and things as well as audit of accounts.

We, the railways, are big enough to have our own efficiency engineers. This is a distinct function for the staff as contradistinguished from the line. Efforts, more or less crude, to introduce special staff work have signally failed on a number of railways. The underlying cause has been a violation of the principle that the staff can never as such directly command the line. The temptation of the special staff men, call them inspectors or efficiency engineers, if you please, is to become meddlers. They are so enthusiastic for the cause that they desire to save the country and reform the road all on the same day. The men who succeed at special staff work are those who stick to the principle enunciated. An inspector, because he is a staff officer, should never give an order.

The coming new department of inspection or efficiency, like all innovations, will have its troubles. One of the temptations will be to build up an office full of clerks to check a lot of unnecessary reports. The head of the department, whether he be called general inspector or vice-president, will have to remember that untrained persons do not necessarily become endowed with superior intelligence and professional acumen by the privilege of personal contact with him and assignment to his department. To be successful his department will consist of a corps of highly trained inspectors of official rank and experience, capable of first hand dealing with things and men. The tendency of both inspection and audit is to become perfunctory. One remedy, found efficacious by the army, is definite and periodic rotation from the line positions. The law of the survival of the fittest will bring out those all-around men who can succeed in both line and staff. The superintendent who has been detailed as an inspector for a year or two will return to a division with a broader view and will be a better superintendent. He will not resent the inspection of his division by the other department, because conscious of the fact that the inspectors are at least his equals, and perhaps his superiors, in experience and rank. These inspectors will certify not only that the money has been honestly and legally expended, but wisely and efficiently as well. While an absoute essential, honesty is not the only component requirement of good administration. The one road on which good intentions are standard ballast is not as yet telegraphing its accidents and its density of traffic to the Interstate Commerce Commission.

Affectionately, your own, D. A. D.

VENTILATION OF SLEEPING CARS.*

BY THOMAS R. CROWDER, M. D.

For the purpose of securing a suitable exchange of air in railway cars many types of ventilators have been suggested, and not a few have been given practical tests. About three years ago I was asked to report on the efficiency of one of these ventilators that had been applied to a few sleeping cars, and which seemed to be of considerable practical usefulness. All air contains carbon dioxide as a normal constituent. The average amount in pure air is commonly stated to be 4 parts in 10,000. The average for fifteen samples, which were collected in the country districts of Illinois in 1907, was 3.6, with a maximum of 4.

For thirty-nine samples from the streets of Chicago during the same period, the average was 4.06 with a maximum of 5. The carbon dioxide in the expired breath averages more than 4 per cent. (400 in 10,000). In a mixed community of persons at rest it will average about 0.6 cu. ft. per person per hour, and the variation will be a small one.

If there were no ventilation whatever the air of an ordinary railway coach, containing 4,000 cu. ft. of space and occupied by 20 people, would have 34 parts of carbon dioxide per 10,000 of air at the end of one hour of occupancy. But no car is air-tight, consequently the carbon dioxide will never reach its theoretical limit. It is plainly impossible to measure directly the amount of

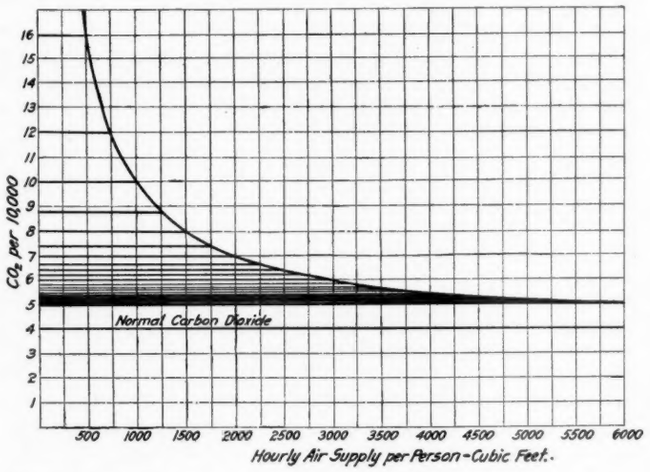


Fig. 1—Hourly Air Supply Per Parts of Carbon Dioxide.

air flowing into a car, but the amount of the interchange may be readily computed from the actual amount of carbon dioxide found from time to time by applying the figures given above to a simple mathematical procedure. Fig. 1 represents graphically the mathematical relation between the carbon dioxide in the air of a room and the hourly air supply per person, assuming 0.0004 as the proportion of carbon dioxide in the outside air and 0.6 cu. ft. as the average hourly excretion. It is seen that the increase above the normal is in an inverse ratio to the air supply. Six thousand cu. ft. per person per hour allows an increase of 0.0001 in carbon dioxide; 3,000, an increase of 0.0002; 1,000 an increase of 0.0006, and so on. With any given air supply the carbon dioxide representing respiratory contamination increases directly as the number of people present. Numerous reports are to be found upon particular types of ventilators and ventilation systems as applied to railway cars. An excellent and extensive report of this order was made by a committee of the Master Car Builders' Association, in 1908, in which the various systems in general use were reviewed in detail. There is, however, no series of analyses extensive enough on which to base any comprehensive opinion as to the deficiencies of natural ventilation to be overcome, or as to the adequacy of the devices applied in keeping the air of the breathing-zone freed from the products of respiration.

The Garland ventilating device, described in the *Railway Age Gazette* of June 22, 1910, page 1757, on which this report is based, is designed to remove air by exhaustion from the upper portion of the car, and its operation is dependent on train motion. A long series of anemometer readings have shown that each such exhaust ventilator will remove an average of about 15,000 cu. ft. of air per hour at a 40-mile train speed, and proportionately more or less for faster or slower speeds. One ventilator is placed over each alternate section of a sleeping car; thus there are 6 in the sleeping compartment of the ordinary 12-section car and 8 to a 16-section car, while two are applied to the smoking room and one to a stateroom. Toilet and dressing rooms are also equipped with one each in recent practice. It was desirable also to make determinations in cars not having the exhaust ventilators, but depending upon natural ventilation, for purposes of comparison. Samples of air were collected chiefly in the course of ordinary travel, the purpose being to study actual and general conditions as they exist normally. All of the observations were made at temperatures from below zero to 65 deg., being in the majority of cases below 40 deg. The larger portion of the observations were made during the night after the passengers had retired, in order to obtain a study of the chief feature of the sleeping car, namely, the occupied berths.

Before giving the analysis of the air inside of the car it is necessary to know the amount of carbon dioxide in the outside air. As the locomotive emits a large volume of gas, it is expected that the carbon dioxide content would be high. Leissner, a German investigator, found it to be 18 to 22.8 per 10,000, but my results show, in 46 determinations, an average of 4.04; the highest was 10, the lowest 3. The most ordinary condition for the natural ventilation of cars in cool weather is to have the doors and windows closed and a certain proportion of the small windows, called deck sash, at the top of the car open. For 153 observations the average carbon dioxide was 7.19 per 10,000, the maximum 13, and the minimum 3.5. The average number of passengers for the 153 observations was 15.05. A car carrying this number of people would require 28,300 cu. ft. of fresh air hourly to maintain the carbon dioxide at 7.19 parts per 10,000. In other words, there would necessarily be an air supply of 1,880 cu. ft. per person hourly. Adding to the open decks by opening one or both end doors to the vestibule (the outside vestibule doors being closed) would be expected to cause a greater air supply. Such is the case as shown by the 46 other observations. Tests were made with first the front, and then the rear door open, but there seemed to be no consistancy as to which door acts best in the capacity of a ventilator, for at times large quantities would enter and then again the air would leave the body of the car through the same door. It was also observed that a few open windows in the moving train admitted such a volume of surrounding air as to render the respiratory contamination almost undetectable. The comparative efficiency in four groups of tests stands: 18,500 cu. ft. of air hourly for the fully closed car; 28,300 when from one-fourth to all the decks are open; 32,500 when decks are closed and one door open; and 40,700 where end doors are open in addition to open decks. It is, of course, possible that a larger number of observations would materially change these figures, but it is not probable that their relation to each other would be greatly altered.

The results of the carbon dioxide determinations of air at the breathing level of sleeping cars, equipped with the exhaust ventilators previously mentioned, shows that the air supplied to the breathing zone, as computed from carbon dioxide determinations, is considerably less than the amount which leaves through the ventilators, as determined by actual measurement. But in spite of this the air supply is much increased and is better regulated than in cars not so equipped. Records of 294 determinations in 67 cars which were fitted with these ventilators were taken in which all doors and windows were closed. The maximum carbon di-

*Abstract of a paper presented at the annual meeting of the American Public Health Association, Milwaukee, September, 1910.

oxide was 10 parts per 10,000 of air, the minimum being 4.5 parts. The average carbon dioxide was 6.20 per 10,000 and the average number of passengers 14.88. There would be required 40,600 cu. ft. of air hourly to satisfy these conditions. It is seen that there is a distinct advantage in favor of the cars equipped with exhaust ventilators over those ventilated by the decks, and that this advantage represents an average addition in the air supply to the breathing level of about 12,000 cu. ft. of air per hour.

Fig. 2 shows clearly that the air supply to sleeping cars, as computed from 555 carbon dioxide determinations, is for all except the completely closed car without ventilators a large one relative to the number of passengers, and would not allow the average carbon dioxide to go above ten in any but this one condition unless the cars were crowded beyond their natural

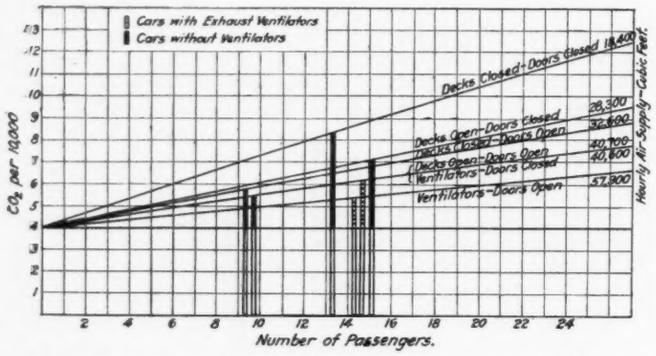


Fig. 2—Carbon Dioxide and Air Supply in Cars Under the Various Conditions Tested.

capacity. It very rarely happens that sleeping cars carry more than 25 passengers. Such a case did not come under my observation in the collection of these 555 and many other samples of the air. It should be understood that all of the above observations apply to the main compartment of the standard sleeping car in motion; and in setting down the number of passengers only those persons were counted who were actually in this compartment, and who had been there for a period of at least ten minutes at the time the samples of air were being collected.

In order to test the consistency of the results obtained and to find that the carbon dioxide actually does go up in proportion to the number of passengers, these 555 observations were divided into four groups, as shown below:

	Natural Ventilation.			Exhaust Ventilators.		
	Passengers.	CO_2	Hourly Air Supply.	Passengers.	CO_2	Hourly Air Supply.
Less than 10 passengers	7.48	5.91	23,500	9.10	5.58	34,600
Between 10 and 15 "	13.29	6.62	30,500	13.51	5.95	41,600
Between 15 and 20 "	17.57	7.38	31,200	17.65	6.46	43,000
More than 20 "	23.18	8.85	28,700	23.24	7.42	43,000
Averages	13.70	6.88	28,500	14.82	6.11	42,100

From the above data it is seen that the carbon dioxide increases with an increase in the number of passengers. When the number is below 10 we cannot look on the results of the analyses as of great value, because of the unequal distribution. In all the latter part of the work no samples were taken under these conditions; and those that were taken represent chiefly samples taken in single places in the car, and not average samples taken while walking up and down the aisle.

Another method of determining the ventilation of cars equipped with exhaust ventilators was to observe the rate of disappearance of the carbon dioxide from the cars after they had passed through a tunnel. Fig. 3, showing a series of observations under these conditions, it will be seen that there is considerable irregularity. Although the ideal conditions for such tests would be an empty car, the rapid disappearance of the gas is readily shown and the curve is a fairly representative one.

When taking samples of air from the berths it was the rule to take, as near simultaneously as possible, an average sample from the aisle for comparison. Samples from each place were generally repeated at 15 minute intervals, until 20 or more had been collected in the car. Two lower berths on each side of the car were generally selected, availability determining the choice, and one or two uppers when possible. In the test on cars without ventilators and with all doors and windows closed there were 321 determinations of carbon dioxide made in 21 cars for the lower berths and 41 in 11 cars for the upper berths, and their averages were as follows:

	Lower.	Upper.
Number of people in car.....	16.41	20.51
CO_2 per 10,000 cu. ft. of air—		
Aisle	7.32	8.37
Aisle, maximum	10.00	13.00
Aisle, minimum	4.50	6.00
Berths	8.32	9.17
Berths, maximum	18.00	18.50
Berths, minimum	5.00	4.50
Berths, tests giving CO_2 over 12.....	4	4
Berths, tests giving CO_2 over 10.....	37	8
Berths, tests giving CO_2 over 8.....	143	25
Berths, tests giving CO_2 over 6.....	8	1
Tests giving more CO_2 in berths.....	203	24
Tests giving more CO_2 in aisles.....	55	7
Hourly air supply per berth necessary to maintain average CO_2 1,389		1,161

In 17.1 per cent. of the berths the carbon dioxide was lower than in the aisle at the same time; in 63.2 per cent. it was higher

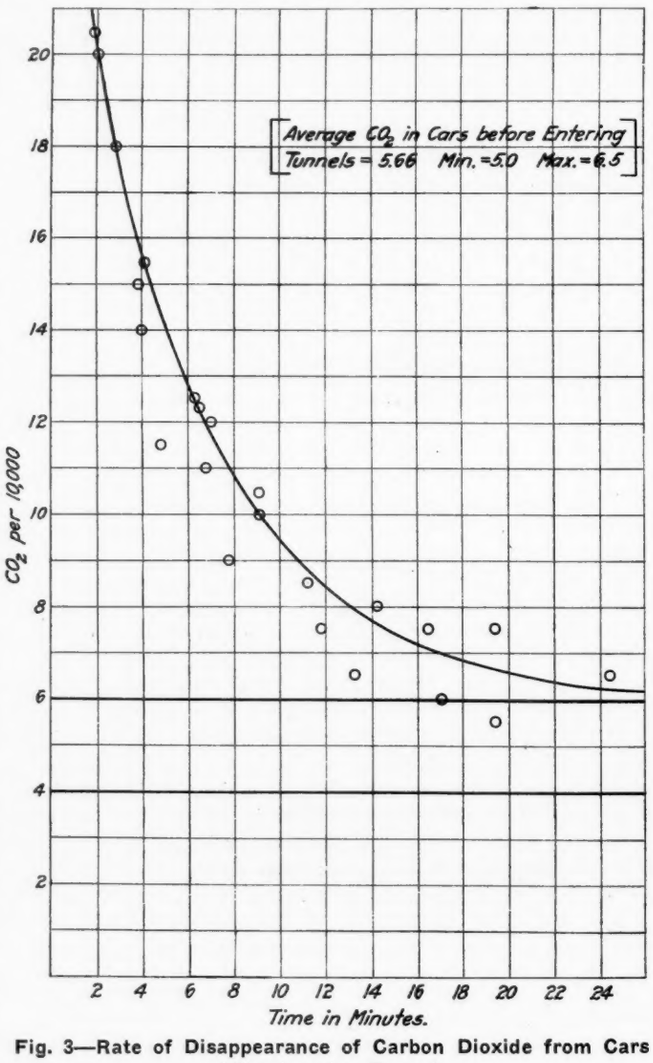


Fig. 3—Rate of Disappearance of Carbon Dioxide from Cars After Leaving Tunnel.

than in the aisle, and in 19.6 per cent. they were equal. The lowest average carbon dioxide for the berths of any car was 6.41, the highest was 9.78; inversely, the largest equivalent air supply was 2,473 cu. ft. per hour, and the smallest was 1,038 cu. ft. per hour. If a considerable number of the upper berths are occupied

the car is necessarily well filled. The higher number of passengers would logically account for a higher carbon dioxide in the body of the car. With open decks it would be expected to find better ventilation in the upper part of the car. In a comparison of the lower and upper berths in the same car, from 91 determinations for the lower berths and 34 for the upper we have the following averages: The lowers were 8.43 carbon dioxide per 10,000, and the uppers 8.85. The equivalent hourly air supply per berth was: lower 1,354, and upper 1,237.

In the test on cars equipped with exhaust ventilators there were 690 carbon dioxide determinations in 42 cars for lower

		Average CO_2 per 10,000.		Equivalent hourly air supply per berth, cu. ft.	
Cars.	Series.	Lowers	Uppers.	Lowers.	Uppers.
1	59	8.65	8.70	1,290	1,277
2	76	7.47	9.63	1,749	1,065
3	96	5.51	5.75	3,937	3,428
4	99	6.36	6.62	2,541	2,290
5	104	6.13	7.25	2,812	1,846
Totals—Average.....		6.51	6.70	2,391	2,222

The averages of the totals (132 lower and 53 upper berths) and the corresponding ventilation equivalent show that this difference is very small. It seems clear that the average ventilation of the lower berth in this type of car is on the average slightly

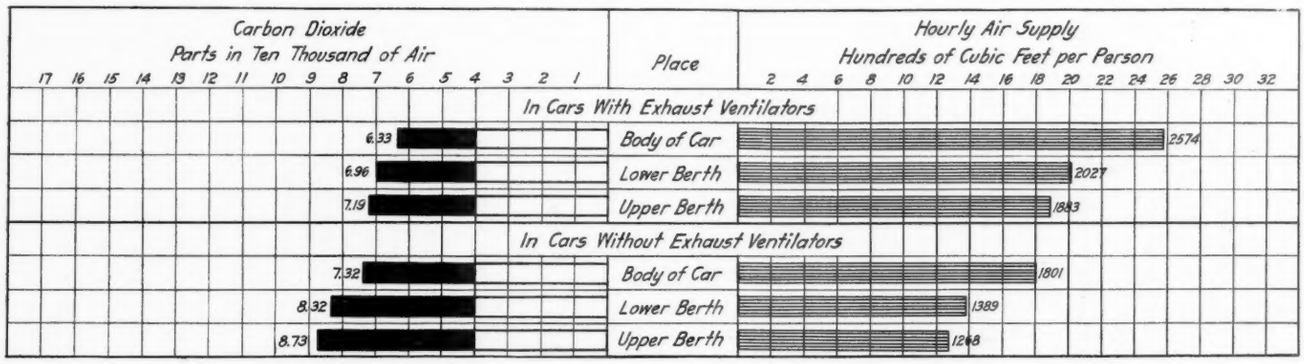


Fig. 4—Comparisons of Carbon Dioxide in Cars With and Without Exhaust Ventilators.

berths and 53 in 5 cars for the upper berths and their averages are as follows:

	Lower.	Upper.
Number of people in car.....	15.72	16.72
CO_2 per 10,000 cu. ft. of air—		
Aisle	6.33	5.95
Aisle, maximum	10.00	9.5
Aisle, minimum	4.5	4.5
Berths	6.96	6.70
Berths, maximum	13.5	10.5
Berths, minimum	4.5	4.5
Berths, tests giving CO_2 over 12.....	1	0
Berths, tests giving CO_2 over 10.....	23	1
Berths, tests giving CO_2 over 8.....	150	9
Berths, tests giving CO_2 over 6.....	169	17
Tests giving more CO_2 in berths.....	440	41
Tests giving more CO_2 in aisles.....	141	3
Hourly air supply per berth necessary to maintain average CO_2	2,027	2,222

In all but three of the 42 cars, the average carbon dioxide for the lower berths was higher than the average for the aisle; but the average difference for all observations was only 0.63 parts per 10,000. The lowest average carbon dioxide for the berths of any car was 5.38 and the highest was 9.34; the largest equivalent air supply was 4,348 cu. ft. per hour, and the smallest 1,123 cu. ft. per hour. The upper berths was higher than the aisle at the same time in 94.3 per cent. and lower in 5.7 per cent.

I am able to compare the lower berths with the upper berths in five cars, as shown in the following table. Samples were taken from the lower and upper berths simultaneously.

better than the upper, but the difference is so small as to be of no practical consequence. If we bring into comparison the conditions of the two classes of cars, those without and those with the exhaust ventilators, a decided advantage is seen to lie with the latter in the study of berth conditions, as was before noted in the study of air from the car body. This comparison is graphically represented for the general averages of the lower berths and the aisles in Fig. 4.

About 200 samples of air were analyzed from still cars and it was found that the carbon dioxide increases more or less rapidly when the car stops running according to the strength and direction of the wind. In only two instances did it pass above 20 per 10,000, and those were in lower berths. It is usual to find the maximum around 15 in cars that are occupied at stations awaiting very late departure. The effect of starting the train

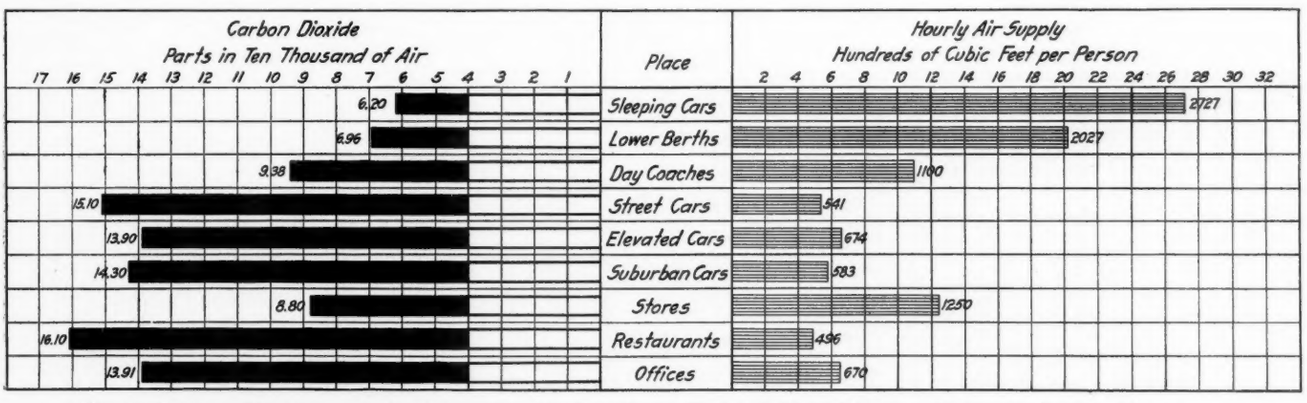


Fig. 5—Carbon Dioxide and the Necessary Air Supply as Determined in Various Congested Public Places.

is invariably to bring down the carbon dioxide rapidly. After 30 minutes it has reached as low a point as it can be expected to maintain.

It has been shown that an average of over 40,000 cu. ft. of air per hour enters the breathing zone of sleeping cars equipped with the type of exhaust ventilator herein considered. It has further been shown that nearly twice as much leaves through the ventilators. This difference is to be accounted for by the air working through the cracks and crevices of the car. There

are approximately 500 lineal feet of these crevices under windows, doors and decks, which if they were open only 1/50 in., and admitted air at one-half the rate of train speed would more than account for the 40,000 cu. ft. The ventilation of sleeping cars has been determined in terms of air supply, using carbon dioxide as the basis of computation, and it is now to be shown the cause of discomfort which may arise, supposedly as the result of insufficient air supply. It has been very generally accepted that carbon dioxide in such amount as is likely to be found in inhabited rooms, even up to 50 parts in 10,000, is in itself entirely harmless, but that when this is due to respiration certain poisonous organic bodies are also present, of which the carbon dioxide is an accurate index. The allowable amount of carbon dioxide as a respiratory impurity has been variously placed at from 2 to 10 parts, or a total of 6 to 14 parts, in 10,000 of air, the limit being placed at that degree of contamination at which the sense of smell begins to give the first indication of closeness to one entering the room from without. Determinations of carbon dioxide were made from the air of various places occupied by an unknown number of people for purposes of comparison and the average results are shown in Fig. 5.

It was suggested, long ago, by Hermans, a German investigator, that the discomfort was not so much the chemical changes in the air as it was the thermal. Heat and aqueous vapor increase rapidly in the ill-ventilated places with many occupants, and thus prevent the usual dissipation of body heat to the surrounding air. In experiments performed at the Institute of Hygiene in Breslin, Germany, it was shown that a healthy person placed in a closed cabinet could stand,with no symptoms of illness or discomfort, carbon dioxide, as breathed out by himself, up to the amount of 100 or 150 parts in 10,000, provided that the temperature and moisture were kept low. However, when the temperature and moisture were allowed to increase, depression, headache, dizziness and a tendency to nausea were experienced. Under these conditions the normal dissipations of body heat was interfered with. The evidence presented by investigators is such as to be convincing. It seems to be established beyond any reasonable doubt that discomfort is not due to any change in the chemical composition of the air but to physical changes only; and that to maintain a normal heat interchange between the body and the air is to avoid the development of those symptoms which are commonly attributed to poor ventilation. A certain amount of fresh air must be supplied, of course, but the most vital element of the ventilation problem becomes that of regulating the temperature of the air.

It seems probable that one main cause of the complaint of poor ventilation in the sleeping car berth is purely psychic. We are used to sleeping rooms with walls and ceilings far from us. In the berth they are very close. Their very nearness is oppressive. It seems as if there cannot be enough air in this small space to supply our wants. The sensation is often quite independent of the amount of air supplied and even of the temperature. The average carbon dioxide in the air of running cars rarely shows more than 10 parts in 10,000. No danger to health is to be apprehended under the conditions ordinarily obtained even in steel cars. Overheating is the paramount evil; it is the thing to be chiefly guarded against in the attempt to maintain comfort and hygiene, although it is not feasible to cool the naturally overheated air in summer or to dry it when excessively humid. Experience has shown that it is necessary to have in sleeping cars at least twice as much radiating surface as is demanded in common practice for heating the same space in houses. Although the avoidance of overheating in winter would seem to be an easy thing, it is a matter of considerable difficulty to meet the rapidly changing conditions through which cars may pass.

Paris is planning to extend its system of subways. A law has recently been passed which provides $48,000,000 for that purpose.

GOVERNMENT REPORT ON BRIDGEPORT DERAILMENT.

The Interstate Commerce Commission has made public the report to the commission made by H. W. Belnap, chief inspector of safety appliances, on the derailment at Bridgeport, Conn., July 11. Following are the principal facts additional to those already given in the *Railway Age Gazette*. (July 14, page 90 and August 18, page 315.)

The telegraphic report from the railway, required by the commission, was not received until July 12, but Mr. Belnap was near Bridgeport and reached there in the afternoon of the 11th. The train had made eleven stops before reaching the place of the accident, which would indicate that the air brakes were in good working condition. The engine lodged more than 400 ft. from the point of derailment, indicating the speed at which it must have been running. The evidence showed that the controlled manual block signals were in good working condition. The interlocking is not equipped with approach locking; this did not contribute to this accident, but the lack of such locking might be the means of causing similar accidents. The crossover could not well have been made longer. It is limited on the east by the bridge which carries the tracks over Fairfield avenue, and this is a through girder bridge, the head-room for the street below being rather scant; and on the west the crossover could not be extended without taking it on to a curve. The home signal can be seen from the distant signal, though the view is obstructed for a short distance before reaching the crossover by a large tree, but still there is a view of the home signal for 1,000 ft. Engineman Curtis' sickness with measles was in April. He had apparently entirely recovered and had been on duty three weeks. The service records of Curtis, also of the fireman and signal man are good. In conclusion the report says:

. . . While it is urged that as an extra precaution all crossovers used for diverting trains from one main track to another in the direction of traffic should be long enough to reduce to a minimum the risk of overturning if they are taken at high speed, the proper thing to do is to prevent the high speed where it ought not to be used. This can be accomplished by the use of automatic train control apparatus, with proper speed control features. From the present rate of progress being made in the development of such devices, it is going to be some time before railways are thus equipped, and until such installations are in use, railways should require [see paragraph numbered 2, below].

. . . The signals and rules provided for the prevention of such accidents were adequate had they been observed. The tracks and switches were substantially constructed and safe for the train movement made had the rules been observed. The interlocking and block signaling apparatus performed their intended functions and were properly handled, though no approach locking was installed. . . . It is probable that the disastrous consequences of the disregard of rules and signals might have been prevented had it been reasonably practicable to have installed a No. 18 or No. 20 crossover instead of a No. 8 slip, and had same been used at this point.

As a preventive of such accidents, it is recommended—

(1) That in all situations where accidents are likely to occur through the non-observance by enginemen of signals or rules calculated to insure safety, automatic train control apparatus should be provided to insure that trains will be brought to a stop in case the signals or rules are not properly observed.

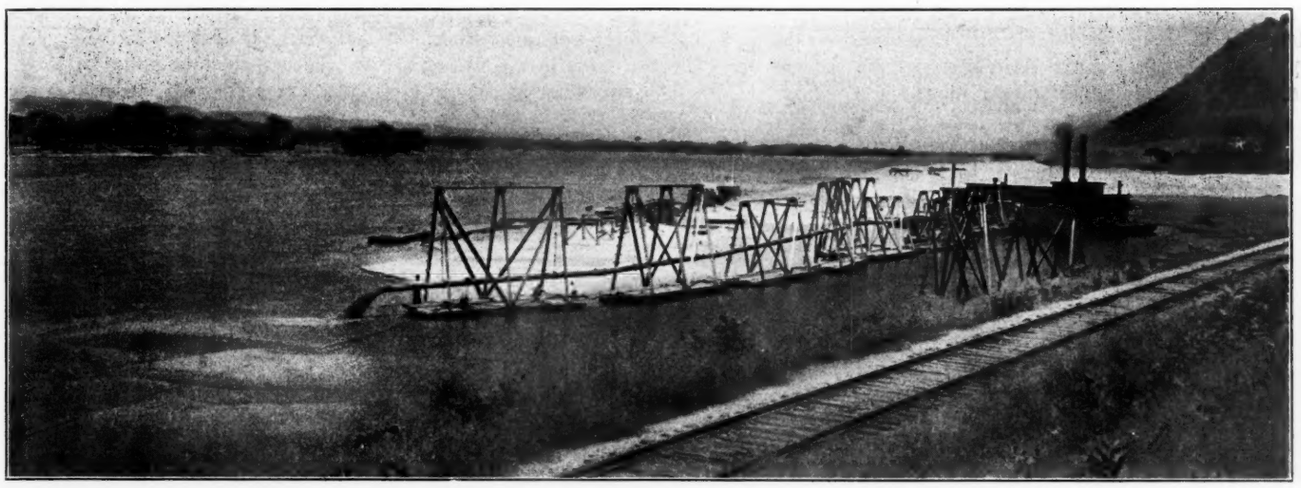
(2) That in the absence of such automatic control apparatus, on tracks where high speed trains are run, switches should not be set to divert a high speed train from one track to another at a crossover which is not safe for high speed until after the train has been brought to a stop.

(3) That at all interlocking plants where trains are operated at high speed over facing switches, approach locking should be provided to prevent the switches being changed from the main or through route to a diverging route after a train has received the signals for the through route.

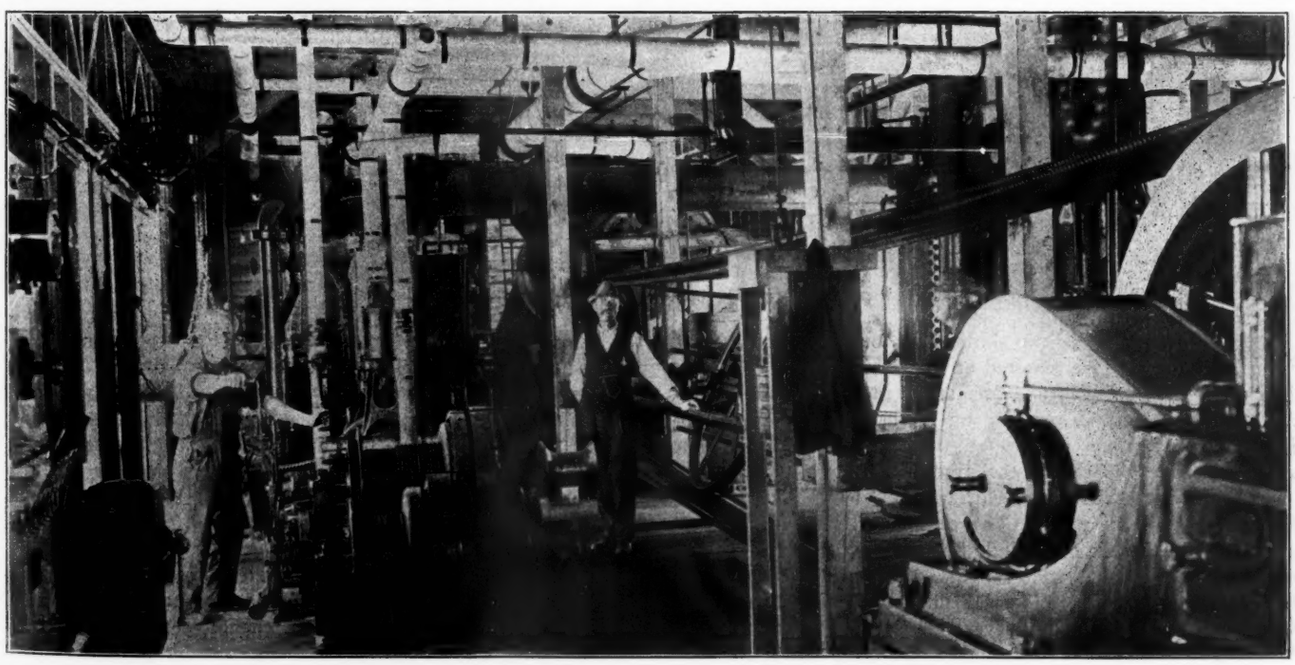
THE BURLINGTON SUCTION DREDGE.

To assist in building a second track between Savanna, Ill., and St. Paul, Minn., the Burlington has constructed a suction dredge, with complete auxiliary equipment. This line follows closely the east bank of the Mississippi river the entire distance, and the dredge is being used to build many of the fills across bays and sloughs. This line is the eastern and southern outlet for both the Great Northern and the Northern Pacific, and because of the heavy traffic handled it became necessary to start the construction of a second track two years ago, which construction is planned to continue until the entire division of 287 miles is double-tracked. At present, 87 miles of this is in operation and 10 miles additional will be completed within the next few weeks. In connection with this work the maximum curvature is being reduced from 3 deg. to 1 deg., while the ruling grade is being lowered from 0.3 per cent. to 0.2 per cent., compensated at the rate of .04 per deg. While in but few cases will it be difficult to reduce the grade to the required standard, the radical nature of the work brought about by the curve reduction will be appreciated when one considers that the road follows closely along the river, and its curvature is governed largely by that of the stream, high bluffs hemming it in closely on the other side. In reducing this curvature the new line crosses many bays which the old line went around. The majority of these cut-offs are very close to the channel of the river, and it is entirely feasible to build the embankments with a dredge, pumping up the sand, of which there are enormous quantities in the river.

While a new departure in railway equipment, the suction dredge is in very common use by the United States government in maintaining a channel on the upper Mississippi, and the design of this dredge was patterned closely after that of the more modern government fleet. The dredge is mounted on a hull 120 ft. long by 30 ft. wide, which is divided into eight compartments by seven longitudinal bulkheads, five of which are 6 in. and two 4 in. thick. This hull is made of Oregon fir treated with 5 lbs. of straight creosote per cu. ft. The bottom planking is 3½ in. thick, while the top decking is of 2½-in. material. All machinery is mounted on this barge. A 15-in. Morris centrifugal pump is connected to an 18-in. suction pipe, 50 ft. long, by two sets of accordion joints, and is swung on a 50-ft. catamaran at the side of the dredge, as shown in the illustration. This pump is



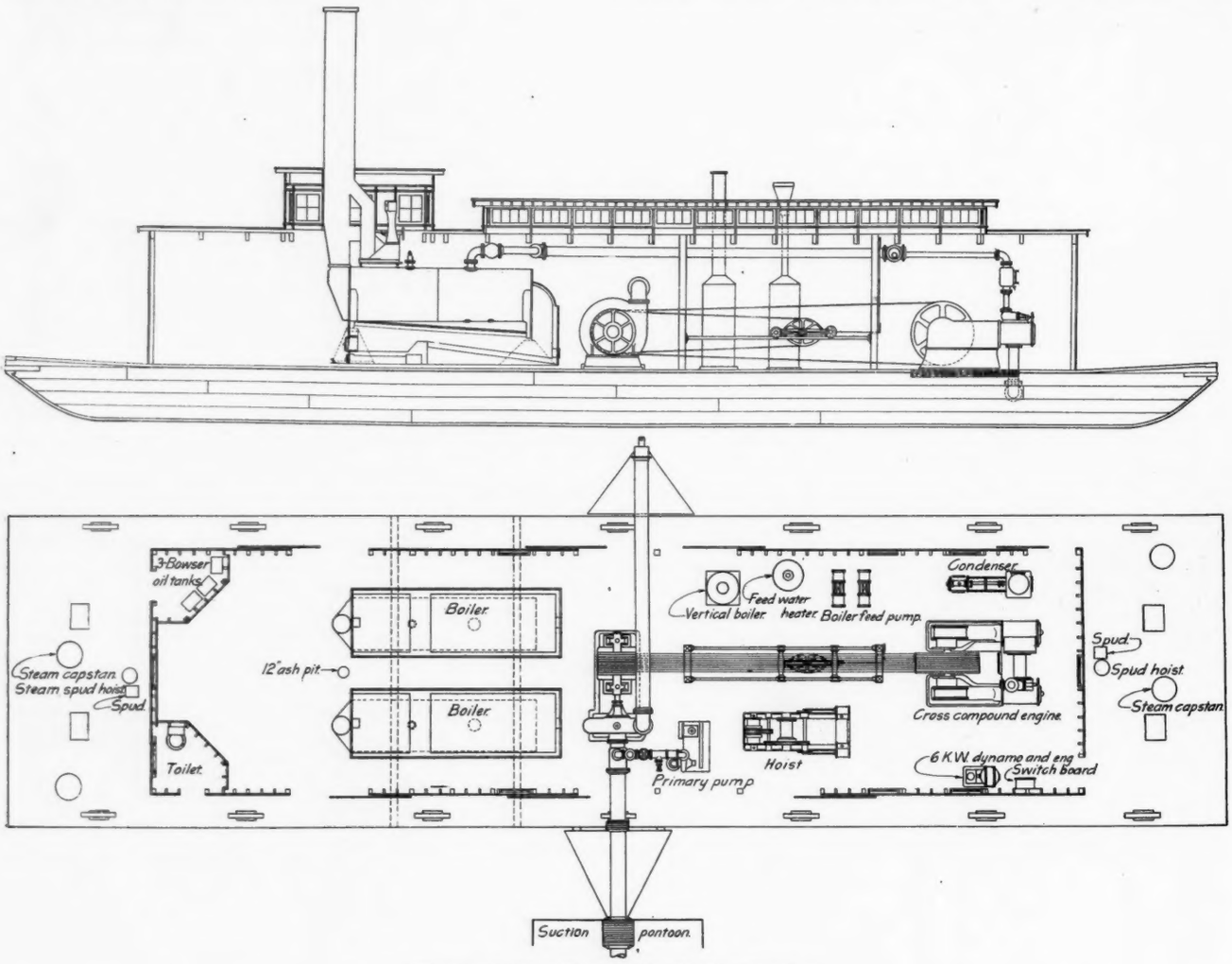
Suction Dredge at Work on Cut-off at Genoa, Wis.



Interior of Suction Dredge, Looking Toward the Boilers.

connected by a rope drive to a 13-in. x 26-in. x 13-in. cross-compound Ball engine, running condensing with a speed of 325 r. p. m., giving a discharge speed of about 13 ft. per second. Two 200-h. p. Lyons boilers, working with induced draft, furnish the power. One 5-in. centrifugal priming pump, one condenser pump and boiler feed pumps are also provided. Steam capstans are located in each end of the barge, while the boat is lighted by electricity furnished from a plant on the barge.

In addition to the dredge and towboat, there are two coal barges 18 ft. x 60 ft. Coal for the boilers is unloaded onto these barges at the nearest siding and towed by this boat to the dredge. Fourteen pontoons, 12 ft. x 32 ft. x 3 ft. are provided to carry the 15-in. discharge line. This pipe is suported on the pontoons by tackle swung from the A-frames, and the sections are connected together by flexible rubber joints.



Plan and Elevation of Burlington Dredge.

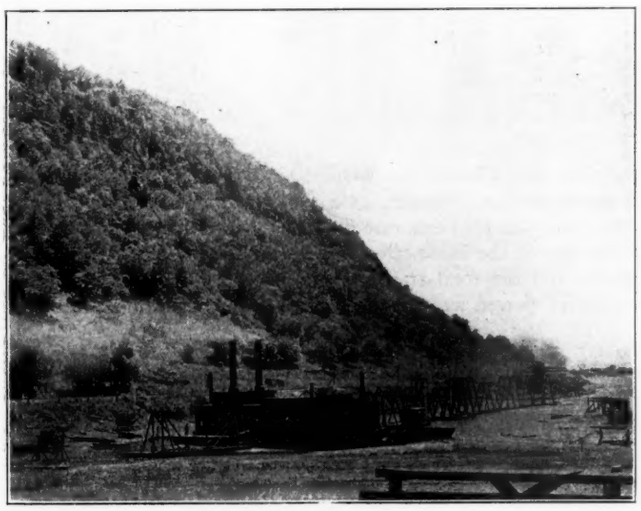
In operating the dredge two shifts of 10 hours each are worked. From 12 to 14 men are required on each shift, consisting of the chief engineer, winchman and fireman on the boat and one foreman and from eight to ten men on the bank. When in operation the suction pipe is lowered through an opening in the center of the catamaran to the sand bed, the end of the pipe being suitably screened to prevent large sticks or boulders entering and injuring the pump. The catamaran is moved laterally and swung in the arc of a circle by cables attached to a winch on the dredge, giving a wide range of operation without moving the dredge. It is possible to move the catamaran without interrupting the pumping, but whenever it becomes necessary to move the dredge the plant must be stopped. In order to reduce these delays as much as possible the dredge is usually started at the up stream end of a fill and worked down stream by slacking on the anchor lines. Although the operator cannot see the suction end of the pipe, he can tell when to shift it by the color of the discharge on the bank, and by the reading of the vacuum gage. If the discharge is black, indicating that the point is in a mud bottom, it is moved, as this mud will not deposit readily, but will remain in suspension, and be carried away with the water. Clear water shows that no solids are being pumped. An endeavor is made to pump about 10 per cent. solids, that is, about 10 per cent. of the discharge is sand and 90 per cent. water. After the bank appears above the water the discharge is run lengthwise down the bank in order that it may deposit as large a percentage of the sand as possible. This discharge is deflected in the proper direction by the use of shields, which are simply pieces of sheet iron placed on edge in the sand. The successful construction of the bank depends to a great extent on the proper and skillful placing of these shields. It is possible to build the bank to an even 1½ to 1 slope without a large amount of labor. No material is handled by the bank men; it is all deposited where wanted by the proper use of these shields. With the pumps working in good condition the rate of output depends directly on the amount of material the bank men are able to hold.

At Genoa, Wis., about 15 miles south of La Crosse, where the dredge has been working this season, unusually favorable conditions have been encountered. An excellent bed of heavy, coarse sand is available in the river, and while it pumps readily it settles very quickly. This one fill will amount to about 300,000 cu. yds., the large quantity being favorable to economical operation, as it is expensive to move an outfit of this kind from one place

to another. During June of this year a total of 94,890 yds. of material was moved in 51 shifts, or an average of 1,861 yds. per shift. This is, of course, as unusual output and is due to the exceedingly favorable circumstances under which the dredge is operating. The more common method of making this fill would be by means of a steam shovel and dumping from a trestle, but a temporary trestle alone would have cost as much as the entire cost of the dredge work in this case, while the material would have to be hauled from the nearest sand pit, 7 miles distant.

In comparing this method with the more common methods it must be remembered that the field for the operation of the dredge in railway work is very limited; also that in the northern states it is possible to operate only from six months to eight months each year; and that when not in service the entire fleet is useless for other purposes. With the steam shovel outfit it is only necessary to lay up the shovel itself and the large cars can be diverted to coal traffic. All banks built by the dredge will wash very readily and must be promptly protected by riprap.

On the other hand, all interference with traffic incident to the operation of work trains on the main lines is done away with by the use of the dredge. This is an important advantage on this class of work, for when the demands of the traffic are



Dredge Showing Suction Pipe Raised Out of Water.

sufficient to require the construction of a second track the addition of numerous work trains results in much delay both to the traffic and to the work trains. Another disadvantage of steam shovel work not possessed by the dredge is that of the damage done to the ballast on the main line caused by material falling from the cars of the work trains. It is impossible to remove the sand, and it makes the track dusty for a long time.

The pontoons were built at Dubuque, Ia., by railway forces, while the rest of the fleet was built at the same point under contract by the Dubuque Boat & Boiler Works, the railway company furnishing all material and machinery. The fleet was first put in service about August 1, 1910. The entire outfit was designed and built under the supervision of T. E. Calvert, chief engineer, and W. L. Breckenridge, engineer maintenance of way lines east, and under the personal charge of W. J. Frien, architect, to whom we are indebted for the above information.

The Buenos Ayres Great Southern Railway, Argentina, has recently opened to public service a new branch railway from Saladillo to San Enrique, which comprises three intermediate stations; Ester, Pueblitos and Mamaguita. The new branch is 38 miles long. It will be served for the present by a mixed train which will run in each direction three times a week. The Chas to Ayacucho Branch Railway has also been opened to traffic. This branch is 91 miles long.

TRAIN RESISTANCE.

BY W. F. KIESEL, JR.

The bulletin on train resistance prepared by Prof. E. C. Schmidt and recently issued by the University of Illinois, describing tests with freight cars, adds much to assist in finally determining a general formula on train resistance of value to engineers, even though the author of the work has not attempted to develop a formula generally applicable to all cars. A study of this subject for the past ten years, or more, has permitted me to gradually develop a formula, the results of which agree very closely with those of the careful tests described by Prof. Schmidt.

In the April, 1897, number of the *Revue Generale des Chemins de Fer*, M. Barbier, of the Chemin de fer nu Nord, presented formulae for train resistance, which, in construction, have been followed by nearly all other investigators. In the *Railroad Gazette*, of May 21, 1897, M. Barbier's formulae were discussed, compared with others, and transformed into formulae with English measurements, as follows:

$$\text{For rigid axles:}\quad R = 3.2 + 2.5V\,\frac{(V + 30.8)}{1000}$$

$$\text{For truck axles:}\quad R = 3.2 + 2.5V\,\frac{(V + 6.08)}{1000}$$

Attention is directed to the fact that the composition of the train, the number of cars, and the total train weight have not been considered. In June, 1899, the Pennsylvania Railroad test department made some careful tests with empty and loaded freight cars, whose weights varied from 13 tons to 75 tons. These cars were in good condition and the most careful records were taken. The results clearly demonstrated that the resistance per ton at very slow speeds decreased as the weight per car increased. The following formula expresses the results very closely:

$$R = \frac{80}{W} + 1.1$$

R = resistance in pounds per ton, and W = car weight in tons.

Comparison with tests made since indicate that the average freight cars are not in as good condition as those used in the test referred to, and that some allowance should also be made for variations in weather. Changing coefficients to conform, the formula reads:

$$R = \frac{100}{W} + 1.5 = \text{Resistance per ton;}$$

$$\text{or } R = 100 + 1.5W = \text{Resistance per car.}$$

Using M. Barbier's general formula

$$R = C + C_1 V + C_2 V^2$$

or as rearranged by the *Railroad Gazette* in 1897,

$$R = C + C_2 V\left(V + \frac{C_1}{C_2}\right)$$

where

V = speed in miles per hour,

and substituting the value $\frac{100}{W} + 1.5$ for C,

making $C_3 \frac{C_1}{C_2}$ and $C_4 \frac{1}{C_2}$ the formula becomes:

$$R = \frac{100}{W} + 1\tfrac{1}{2} + \frac{V\,(V + C_3)}{C_4}$$

The values of C_3 and C_4 in the third term represent air resistance and all other resistances depended on speed and had to be empirically determined; they have been gradually modified due to a study of the tests and experiments of the past ten years. For best average results C_3=16, and C_4=100. These tests also indicate that the third or average speed term varies as the square root of W, which gives for resistance per car:

$$R = 100 + 1\tfrac{1}{2}\,W + .01\,V\,(V + 16)\,\sqrt{W}$$

The resistance per ton will be this value divided by W, or

$$R = \frac{100}{W} + 1\tfrac{1}{2} + \frac{V\,(V + 16)}{100\,\sqrt{W}}$$

If W_1 is made to represent the total weight of the train back of the tender, and N the number of cars, then:

$$R = 100\,N + 1\tfrac{1}{2}\,W_1 + .01\,V\,(V + 16)\,\sqrt{W_1 N}$$

This formula gives good average results for solid trains, including passenger trains with open platforms. For mixed freight trains having various kinds of cars, which increase the air resistance, the denominator of the speed term should be changed from 100 to 90, or possibly 85.

For vestibuled passenger trains, presenting a rather smooth surface, the air resistance will be less, and the denominator of the speed term may be increased to 110, or, in exceptional cases, to 120. For ready comparison with tests and other data, a tabulation of the resistances in pounds per ton for various speeds and weights per car is given:

Freight Car Resistances in Pounds Per Ton on Level Tangents for Car Weights; in Tons.

Miles Per Hour.	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
5	6.735	5.710	5.025	4.535	4.166	3.879	3.648	3.460	3.302	3.163	3.054	2.954	2.867	2.790	2.722
10	7.081	6.200	5.308	4.768	4.411	4.110	3.868	3.669	3.502	3.361	3.239	3.134	3.041	2.958	2.885
15	7.540	6.430	5.682	5.143	4.735	4.415	4.158	3.945	3.767	3.615	3.484	3.370	3.270	3.181	3.101
20	8.110	6.940	6.148	5.574	5.138	4.796	4.518	4.289	4.096	3.931	3.789	3.665	3.555	3.457	3.370
25	8.792	7.550	6.705	6.099	5.621	5.250	4.950	4.700	4.490	4.310	4.154	4.017	3.896	3.789	3.692
30	9.586	8.260	7.353	6.661	6.182	5.779	5.452	5.179	4.948	4.750	4.578	4.427	4.293	4.173	4.066
35	10.491	9.070	8.092	7.375	6.847	6.383	6.024	5.725	5.471	5.222	5.062	4.894	4.746	4.613	4.493
40	11.509	9.980	8.923	8.144	7.541	7.061	6.668	6.339	6.059	5.817	5.606	5.420	5.254	5.106	4.972
45	12.638	11.590	9.845	8.998	8.340	7.814	7.382	7.019	6.711	6.438	6.210	6.003	5.819	5.654	5.505
50	13.879	12.100	10.858	9.936	9.222	8.641	8.167	7.768	7.427	7.147	6.873	6.644	6.439	6.256	6.090
55	15.231	13.310	11.963	10.959	10.174	9.543	9.022	8.584	8.208	7.882	7.596	7.209	7.116	6.912	6.727
60	16.696	14.620	13.158	12.038	11.209	10.520	9.959	9.467	9.054	8.694	8.376	8.232	7.848	7.623	7.418
65	18.273	16.030	14.445	13.243	12.324	11.571	10.946	10.405	9.964	9.569	9.222	8.913	8.636	8.388	8.161
70	19.961	17.540	15.824	14.534	13.518	12.696	12.013	11.435	10.938	10.505	10.124	9.784	9.480	9.201	8.957
75	21.761	19.150	17.293	15.896	14.790	13.898	13.152	12.517	11.978	11.504	11.086	10.714	10.380	10.080	9.805
80	23.672	20.860	18.854	17.341	16.142	15.171	14.361	13.916	13.061	12.564	12.108	11.701	11.336	11.007	10.707

To permit of a ready determination of the work locomotives may perform a knowledge of the resistance of the train back of the tender is not sufficient, as the calculations must necessarily include locomotive and tender resistances. Unfortunately, results of road tests made at home and abroad are given in pounds per ton for the engine and tender combined. There seems to be no valid reason why the tender should not be considered as a car. Similarly the weight carried by engine trucks offers about the same resistance as car weight.

This statement is corroborated by data given by Prof. Goss, in his book, Locomotive Performance, page 419, where the engine truck and the tender load of the locomotive is given as 100 tons; tractive effort to overcome rolling load resistance at 366 lbs. at 10 m. p. h., and 1,033 lbs. at 50 m. p. h.; or 3.66 lbs. per ton at 10 m. p. h., and 10.33 lbs. per ton at 50 m. p. h., agreeing very closely with the resistance per ton for two cars weighing 100 tons, or 50 tons each (see table) at 10 m. p. h. This is 25 per cent. higher than the figure in the table at 50 m. p. h. Prof. Goss further bases machinery resistance on cylinder and driver dimensions. It would seem advisable to introduce additional resistance based on the number of drivers coupled together. As it is extremely difficult, and probably impossible, to definitely determine whether the use of cylinder and driver dimensions, or, on the other hand, the weight on drivers should be used as a basis for machine friction, the weight on drivers has been selected.

Prof. Goss' experiments with Schenectady locomotive No. 1 show the machine friction to vary between 142 and 742 lbs. The weight on drivers was 28 tons, hence the machine friction varied between 5 lbs. and 26 lbs. per ton of driving weight. The Pennsylvania tests at St. Louis show values between 12 lbs. and 66 lbs., with 22 lbs. a good average. In the latter tests two values were below 12 lbs., and may be considered abnormal. Assuming that the engine and tender resistance is considered equivalent to that of three cars of the same total weight as the engine and tender plus M, a value for engine friction and head end resistances, then:

$$R = 200 + 1.5\,W + .01\,V\,(V + 16)\,\sqrt{3\,W + M}$$

W = the total weight of engine and tender.

Formulae by various authorities have been tabulated by Mr. Lawford H. Fry in *Engineering*, March 26, 1909. If M is made equal to $(12 + .01V^2)\,P$, in which P = weight on drivers, the above formula will give results approximating the average results given in *Engineering* for four-coupled and six-coupled locomotives, but not as high as the results given for eight-coupled locomotives. The value 12P is rather too low, considered purely as the friction term. Prof. Goss' tests would point to a friction term equal to 15P or 16P, and the Pennsylvania tests at St. Louis to one equal to 22P. Without further careful road tests, it is impossible to assign values which can be definitely designed as machine friction and total head end resistances, and the value $M = (12 + .01V^2)\,P$ will serve the purpose as representing the difference between the actual locomotive and tender resistance, and the resistance calculated on the basis of the locomotive and tender being equivalent to three cars.

The object of arranging the formula in this shape is to enable the calculator to handle the whole train weight, including that of the locomotive and tender, as a unit, not only for grades and curves, but also for resistance on straight level track. The available power of the locomotive will be the total locomotive power less M, and the total train resistance opposed to this available locomotive power may be expressed by the following formula:

$$R = 100\,N + 1.5\,W + .01\,V\,(V + 16)\,\sqrt{W\,N}$$

R = total resistance in pounds.
N = number of cars back of tender, plus 3.
W = weight of train in pounds, including engine and tender.
V = speed in miles per hour.

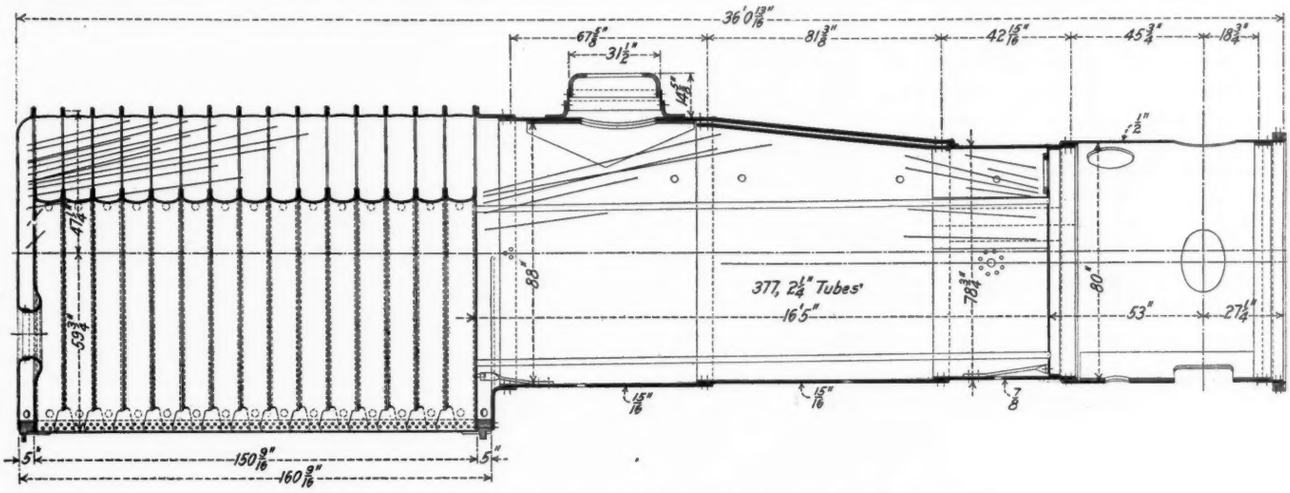
TRAIN TELEPHONE SETS.

On every section where we install telephone train despatching circuits, we equip every train with a telephone outfit, without selectors. The wrecking cars are provided with howler receivers, by means of which the despatcher can call them in on the line if necessary. The connecting pole we use is the invention of J. F. Richardson, Superintendent of Telegraph of the Eastern division of the Canadian Pacific. It is so arranged that connection can be made with any two wires on the line, no matter whether they are on the same arm or not. We do not install any equipment at outlying sidings, as the train equipment answers every purpose should a train become stalled. On account of the severity of our climate during a portion of the year, no one could use a telephone at a pole box, and each outfit contains sufficient flexible twin wire to lead the circuit into the baggage car or conductor's caboose.—*W. J. Camp* (C. P. R.).

Dissatisfied employees, or persons who pretend to be, cut 125 telegraph and telephone lines at Lille, France, and 57 at Roubaix. At Havre 10 telegraph cables connecting with England were severed, and attempts to derail trains have been made. A newspaper, *La Guerre Sociale*, had openly advocated measures of this sort. Its office was searched by the police and six members of its staff were arrested. It delivered its parting shot as follows: *"La Guerre Sociale* will be published no longer; but brave fellows will continue to destroy railway tracks and telegraph lines."

MALLET LOCOMOTIVE WITH 20 DRIVERS FOR THE SANTA FE.

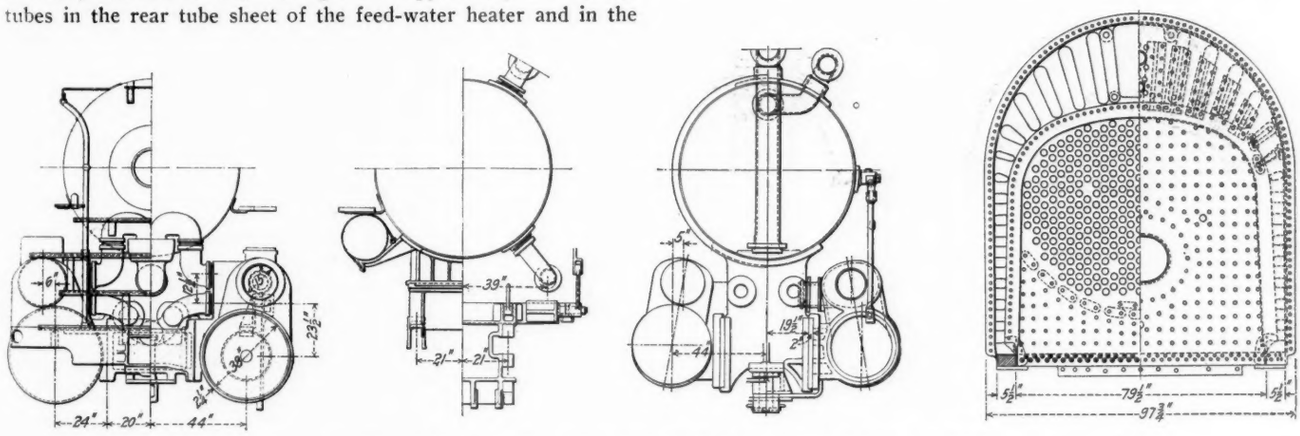
A brief article and a photographic view of a 2-10-10-2 type Mallet locomotive on the Santa Fe, was published in the *Railway Age Gazette* of April 14, page 908. These engines were rebuilt from Santa Fe type locomotives which were built at the Baldwin Works in 1902. The Santa Fe type locomotives weighed 287,000 lbs., and as single engines were probably the most powerful locomotives in the world, having a tractive effort of 62,800 lbs. Ten of them, which required new fireboxes, were selected for the conversion, and were fitted with new fireboxes of the Jacobs-Shupert type arranged for burning oil. The original low pressure cylinders were bushed from 32 in. to 28 in., and were used as high pressure cylinders of the Mallet locomotive.



Rear Section of Boiler for Santa Fe 2-10-10-2 Mallet Locomotive.

The front section of the Mallet, which was built by the Baldwin Locomotive Works, has a wheel arrangement similar to that of the rear unit, and low pressure cylinders 38 in. in diameter by 32 in. stroke. The front boiler section includes a feed water heater 106 in. long, located in the front portion next to the smoke-box. Back of the feed water heater is a narrow space 32 in. wide, with a manhole, which gives an opportunity to caulk the tubes in the rear tube sheet of the feed-water heater and in the front tube sheet of the reheater. The superheater is of the Buck-Jacobs type, consisting of a single drum, whose shell is integral with that of the boiler. The heads are riveted to this shell and support a set of horizontal tubes, which are welded in the heads by the oxy-acetylene blow pipe. An intermediate head divides the superheater into two sections, one for superheating the steam for the high pressure cylinders, and the other, a larger section, for reheating the exhaust from the high pressure cylinders before it passes to the low pressure cylinders. The front section of the boiler is attached to the smoke arch of the old section by a V-shaped ring joint. The articulated joint between the two sections of the frames is made with heavy steel castings, according to the usual practice of the Baldwin Locomotive Works in connection with Mallet locomotives. This is a simple rigid structure beneath the cylinder forming a large hinged pocket, which is partly shown in the drawing of the general plan of the engine.

The arrangement of the steam pipes is that developed by the Santa Fe in connection with their system of superheating and reheating. The steam passes from the dome of the rear section through the ordinary dry pipe, but the tee head is replaced by an elbow which connects to an outside steam pipe on top of the boiler. This leads to the high pressure superheater, and from the lower portion of this superheater there is another outside pipe which leads the steam to the high pressure cylinder. Exhaust from the high pressure cylinder passes through a long vertical pipe which extends to the upper shell of the smoke arch and connects with an elbow to another outside horizontal pipe on top of the boiler. This pipe leads to the reheater, and from here the steam passes by the usual pipe, with large ball and slip joints below the boiler and between the frames, to the low pressure cylinders. By this arrangement the steam pipe joints are all on the outside, where they are readily accessible for inspection and repairs. These joints are not subject to the intense heat which is liable to cause them to leak; when this leakage is in the smokebox or any of the smoke passages connected with the tubes it interferes with the draft of the engine. The

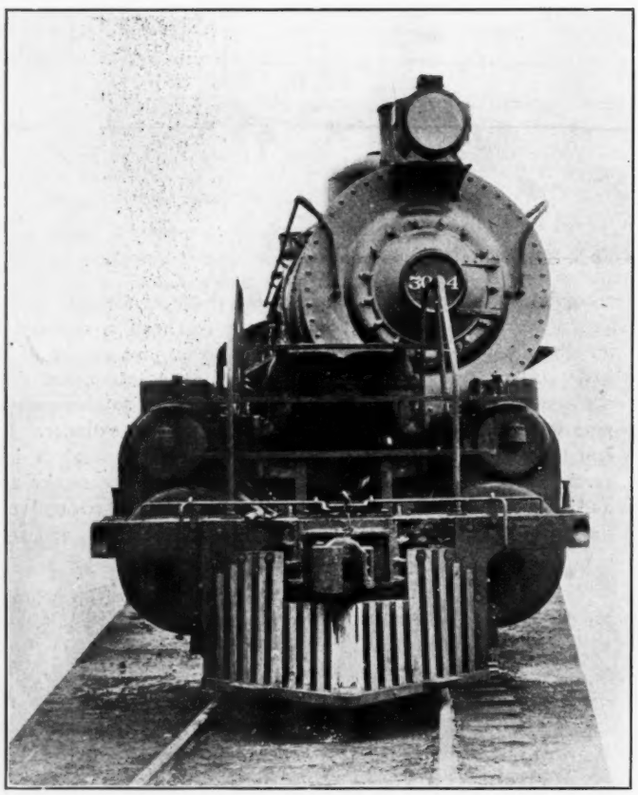


Cross-Sections Through the Santa Fe Mallet Locomotive and Its Boiler.

high pressure piston valve is 13 in. in diameter, and the low pressure, 15 in.; both are operated by the Walschaert valve gear. The feed water is delivered by two No. 12 non-lifting injectors, each capable of delivering 4,200 gal. of water per hour. There are two 8-in. Westinghouse cross-compound air pumps located on the left side of the engine and three main reservoirs having a combined capacity of 100,000 cu. in.

The tenders were designed and built by the Baldwin Locomotive Works especially for these Mallet engines, and on account of the unusual length the rear portion is tapered and the corners rounded to a large radius, so as to give a clear view to the engineer when backing up. The tender has a capacity of 12,000 gal. of water and 4,000 gal. of oil. It is mounted on two six-wheel trucks with cast steel frames, the design being quite similar to that used for passenger cars.

The principal novelty in this engine is its enormous size, and the fact that it is converted from the largest type of locomotive on a single set of drivers to the largest locomotive of the Mallet type. The principal features are the combination of designs developed by the Santa Fe and many of the details common to the Mallet locomotives as built at the Baldwin Locomotive



Santa Fe Mallet Locomotive on a Sharp Curve.

Works. Two of these locomotives have been in successful operation during the last three months west of Winslow, Ariz., and the total order of ten is being rapidly completed. The principal dimensions and ratios are as follows:

General Data.

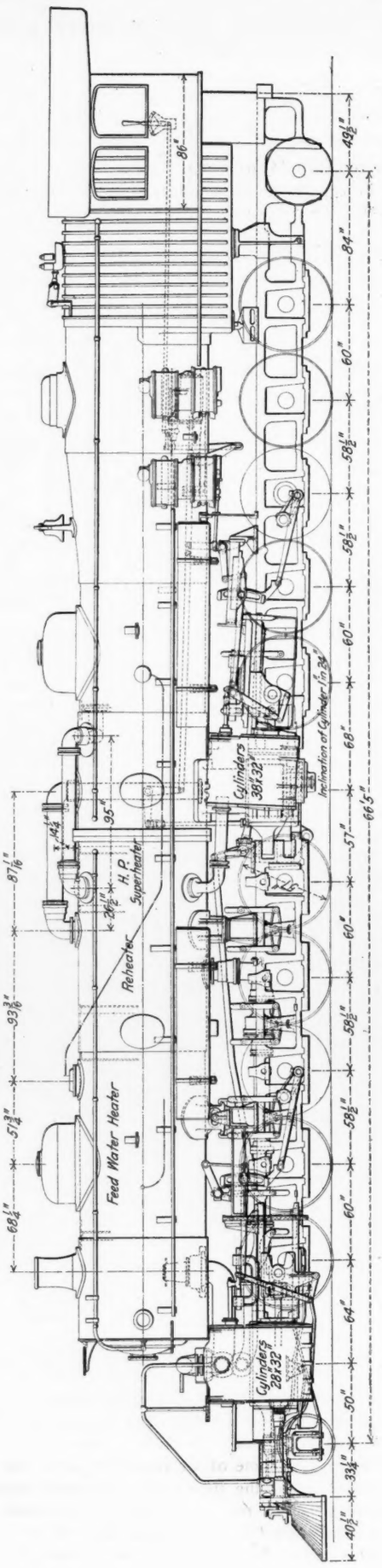
Type	2-10-10-2
Service	Freight
Fuel	Bit. coal and oil
Tractive effort	111,000 lbs.
Weight in working order	616,000 lbs.
Weight on drivers	550,000 lbs.
Weight of engine and tender in working order	850,000 lbs.
Wheel base, total	66 ft. 5 in.
Wheel base, engine and tender	108 ft. 1⅝ in.

Cylinders.

Kind	Compound
Diameter	28 in. and 38 in.
Stroke	32 in.

Valves.

Kind	Piston
Diameter	13 in. and 15 in.



Largest Mallet Locomotive; Atchison, Topeka & Santa Fe.

Wheels.

Driving, diameter over tire	57 in.
Driving journals, main, diameter	11 in. x 12 in.
Driving journals, others, diameter	10 in. x 12 in.
Engine truck journals	6½ in. x 10½ in.
Trailing truck journals	7½ in. x 11⅞ in.

Boiler.

Style	Ext. wagon top
Working pressure	225 lbs.
Firebox, width and length	78¾ in. x 149⅝ in.
Tubes, number and diameter	377—2¼ in.
Tubes, length	16. ft. 5 in.
Heating surface, tubes	3,625 sq. ft.
Heating surface, firebox	294.5 sq. ft.
Heating surface, feedwater heater	2,659.5 sq. ft.
Heating surface, total	6,579 sq. ft.
Heating surface, superheating	2,328 sq. ft.
Heating surface, total equivalent	8,907 sq. ft.
Grate area	81.9 sq. ft.

Ratios.

Total weight ÷ tractive effort	5.55
Weight on drivers ÷ tractive effort	4.95
Tractive effort × diameter drivers ÷ heating surface	.963
Tractive effort × diam. drivers ÷ equivalent htg. surf.	.710
Total heating surface ÷ grate area	80.4
Total equivalent heating surface ÷ grate area	109
Firebox heating surface ÷ total heating surface, per cent.	4.48
*Firebox heating surf. ÷ total equiv. htg. surf., per cent.	3.3
Weight on drivers ÷ total heating surface	83.6
Weight on drivers ÷ total equivalent heating surface	61.7
Total weight ÷ total heating surface	93.7
Total weight ÷ total equivalent heating surface	69.1
Volume both cylinders, cu. ft.	30.1
Total heating surface ÷ vol. cylinders	21.9
Total equiv. heating surface ÷ vol. cylinders	29.6
Grate area ÷ vol. cylinders	2.72

*Total equivalent heating surface equals total heating surface (6,579 sq. ft.) plus reheating and superheating surface.

TUNNEL VENTILATING PLANTS.

The Pennsylvania is installing a large ventilating plant in one of the tunnels under Baltimore. This tunnel is 4,963 ft. long and has a cross sectional area of 432 sq. ft. It was determined that it would require 450,000 cu. ft. of air per minute. This volume will drive a current of air through the tunnel with a velocity of 12 miles per hour, and will give a complete air change in 4¾ minutes.

Immediately over one of the portals is the fan room, the floor of which is 28 ft. above the tracks. In this room are two large electrically driven Sirocco fans, with fan wheels or impellers 12½ ft. in diameter. A division plate divides the breadth of these wheels into two equal sections and air is received from both sides. The air is discharged downward into the tunnel through a nozzle which lies close to the roof. This nozzle is flattened and curved to fit the tunnel arch, so that the air comes out through a slit along the arch extending from the springing line at each side. This draws in air from the portal on the principle of an injector. When a train is moving with the air current, the smoke is driven ahead of the engine; when moving against it, the smoke is blown back over the cab without bothering the engineman.

To discharge the volume of air required and to overcome the frictional resistance of the tunnel, the fan wheel must revolve at a speed of 104 r. p. m., which will require about 190 h. p. to drive it. Only one of these fans is intended to be run at a time, the other is held in reserve for use in case of accident.

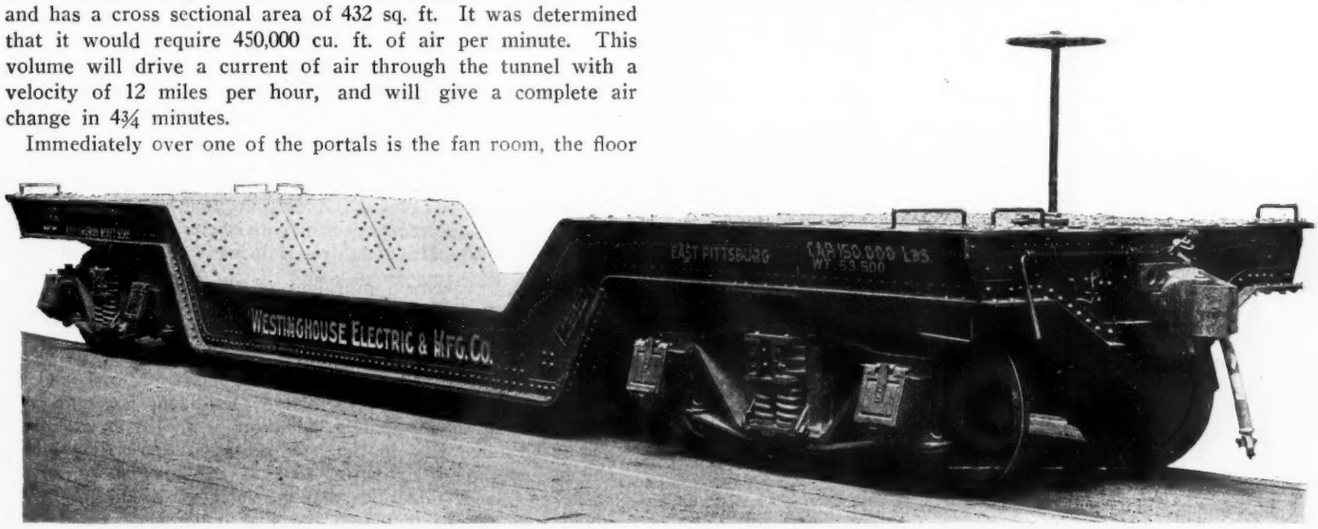
Charles S. Churchill, chief engineer of the Norfolk & Western, who designed the ventilating plants of the Gallitzin, the Big Bend and the Elkhorn tunnels of the Pennsylvania and the Norfolk & Western, also designed this plant. Previous to the installation of the ventilating plant at the Elkhorn tunnel at Coaldale, W. Va., on the Norfolk & Western, it required from 17 to 55 minutes to clear the tunnel of smoke, and during the four years immediately preceding the installation 26 men were asphyxiated. After the installation smoke appeared at the portal ahead before the engine appeared; and in less than a minute after the engine had passed out, the steam had vanished even from the roof, where it usually clings so persistently. The installation of this ventilating plant increased the maximum load of trains and resulted in a reduction of the number of trains necessary to carry a given load.

The Sirocco fan is made by the American Blower Company, Detroit, Mich.

FREIGHT CAR FOR SHIPPING TRANSFORMERS.

A special steel car with a portion of its floor at about the axle height was recently delivered to the Westinghouse Electric & Manufacturing Company by the Atlas Car & Manufacturing Company, Cleveland, Ohio. It was made so that heavy electric transformers may be shipped assembled and ready for installation and immediate use on arrival at their destination. The car will accommodate an oil insulated self-cooling transformer of 2,000 kva. capacity, which will stand 16 ft. above the top of the rail.

The car is entirely of steel, is 35 ft. 5 in. long, and has a capacity in the well of 150,000 lbs., or 75 tons. The surface of the floor in the well is but 2 ft. 2 in. above the top of the rails. The frame is of heavy built up steel girders. The trucks are of 205,000 lbs. capacity with 6 in. x 11 in. journals, 33 in. wheels, and M. C. B. springs of extra large capacity. The center plates are wrought steel and the boxes, brasses, etc., all conform to M. C. B. requirements for 205,000 lbs. capacity journals. Each car is equipped with Westinghouse air brakes, Westinghouse friction draft gear and M. C. B. automatic couplers. The car weighs 53,000 lbs.



Car of 250,000 lbs. Capacity for Shipping Transformers.

The committee of the Belgian Parliament to which was referred the estimates of the railway minister, has reported in favor of increasing both passenger and freight rates, which were long lower than elsewhere in Europe. The committee finds that the employees are insufficiently paid, and that the only way to get money to pay them what they earn is by raising the rates.

General News Section.

At Chicago August 20, Lincoln Beachey in a Curtiss aeroplane soared to a height of 11,152 ft.

A bill which has been introduced in Congress by Senator Poindexter to provide for the conservation of resources in Alaska, contains provisions looking to the construction and operation of railways in Alaska by the government.

The post office department has asked the roads carrying mail between Chicago and St. Louis to make bids for a mail train in each direction, leaving at about 8 p. m. and arriving at about 2 a. m. Bids are to be reecived not later than August 25.

The Baltimore & Ohio has filed suit in a Pennsylvania court to restrain the enforcement of the full crew law of that state, complaining that it is vague and contradictory, and imposes unreasonable penalties. For non-compliance the road might be fined two hundred millions of dollars a year.

The Supreme Court of Georgia has affirmed the decision of the county court in favor of the railway, the Nashville, Chattanooga & St. Louis, in a case where the state of Georgia sued for the value of engines, cars, etc., belonging to the state—the Western & Atlantic Railroad—and used by the N. C. & St. L., the operating company.

H. W. Belnap, chief inspector of safety appliances, has recommended to the Interstate Commerce Commission that the Minneapolis, St. Paul & Sault Ste. Marie be prosecuted for violation of the hours-of-service law; this because of a collision near Superior, Wis., July 5, in which four trainmen were killed and two injured. The men responsible for this collision had been on duty 18 hours, 50 min. Mr. Belnap says that a length of 107 miles of this road had no telegraph office either day or night.

At the La Salle street station of the Rock Island Lines and the Lake Shore & Michigan Southern at Chicago, there have been installed for test automatic electric megaphone devices for calling trains and the names of persons wanted at telephones. The apparatus consists of telephone sounders placed inside bell-shaped megaphones, and a phonograph can be used for calling a long list of stations. The calls are made through a telephone transmitter connected with some 40 of the devices hung in various rooms of the station, and they are heard simultaneously in all rooms.

Attorney-General W. T. Stead and several states' attorneys in Illinois have filed objections in the United States Circuit Court at Springfield, Ill., to the recent report of Walter McClellan Allen, master in chancery in the 2-cent fare case of the Chicago, Peoria & St. Louis. The report was to the effect that the 2-cent fare law was confiscatory as to this road, as it could not earn 6 per cent. from passenger business on the road's investment. The principal objection to the report are the bases Mr. Allen used for the division of common expenses and the property valuations in the state, between the freight and passenger business.

The aeroplane has finally gratified the space-writer prophets of the daily papers by serving as a carrier of news in a business-like way. The French airman, Vedrines, one Sunday morning carried some bundles of newspapers and also some letters from Paris to Deauville, a watering place, and made the journey in about an hour less than is taken by the fastest railway train. The distance, 122 miles, is said to have been traversed in 1 hour, 43 min. The report from which we take this information says that a Paris newspaper proposes to repeat this operation regularly for a time, and is planning to have a "special aerial postal service."

The 14 railways defendants in a suit brought by the Kansas Public Utilities Commission have replied to the commission that the so-called jobbers' tariffs, complained of in the suit and alleged to be discriminatory and unjust, were not originally made by the roads, but were ordered by the old state railways commission. They also state that to reduce the general distance tariffs to the basis of the jobbers' tariffs, as requested by the commission, would work to the benefit of Kansas City shippers at the expense of wholesale, jobbing and manufacturing interests in interior Kansas, and that the effect of such a reduction would be to materially reduce their own revenues.

The railway commissioners of Maine have made a report on the collision which occurred at Grindstone July 28, finding that the excursion train was at fault and that the conductor did not attempt to control the movement of the train after it had left the last station where it had stopped. At that place the engineman said that he could reach Grindstone in time to clear the opposing train, and the conductor relied on the engineman's judgment. The engineman was killed. On the same day that the commission's decision was published, the grand jury of Penobscot county, after considering for five hours a proposal to indict the conductor for manslaughter, refused to take action.

In a telegram explaining that he could not accept the invitation of the Oregon Development League to address its meeting at Astoria, on account of complications resulting from the Spokane rate case, Howard Elliott, president of the Northern Pacific, said: "It is too bad that so much time and attention of some of us, who are doing our honest best to advance the welfare of the country, is taken up by investigations and litigations. It would seem to me that in our country we could advance farther and faster if we had a 'closed season' for legislation. If we could have no more new laws for the next five years, I believe your state would go ahead more rapidly than any of us imagine."

Arthur Hale, general agent of the American Railway Association, who returned last week from Europe, has moved his New York office to the Underwood building, at 30 Vesey street, where the offices of the American Railway Association and the Bureau of Explosives are already established. Now that Mr. Hale is back it is probable that a new secretary will be elected for the arbitration committee on the per diem rules in place of H. F. Campbell, who died suddenly on July 29, as noted in our issue of August 4. Mr. Hale has been in Europe two months, having been called to London suddenly in June by the illness of his daughter, Mrs. Kurt Diederich, with typhoid fever, who, however, died before Mr. and Mrs. Hale were able to reach her.

Thomas J. Freeman, president of the International & Great Northern, has filed an application with the Texas Railway Commission, asking that a new valuation of at least $35,167,000 be placed on its property in Texas, the object being to use the valuation fixed by the commission as a basis for stock and bond issues. In the petition presented by President Freeman, reference is made to a previous valuation of the state commission, and it is stated that in the new valuation there should be included betterments amounting to $7,497,986 that have been made since the former valuation; that the valuation of the Fort Worth division should be included, and that 6 per cent. for franchise value should be added. It is pointed out that the tax board decided during the present year that the road is worth $36,076,982.

J. F. Holden, vice-president of the Kansas City Southern, has issued a publicity bulletin, calling the attention of employees of his road to the superior working conditions existing and high wages and salaries paid on American railways compared with those of Europe. Mr. Holden recently returned from a trip abroad, where he studied these matters carefully. His object in sending out the bulletin is to "show our own men the difference between the wages at home and those paid abroad; and to show the progressiveness of the railway owners and managers of the United States, who have far forged ahead of the owners and managers abroad in providing the necessary tools, namely, big engines, big cars, heavy rails, etc., whereby the men employed to handle trains can earn a greater wage than the same employment permits in England, France or Germany."

A meeting of representatives of 14 Chicago railways and Oscar Monnett, city smoke inspector, and M. E. Harris, his assistant, was held on August 11 in the office of H. F. Wardwell, superintendent of motive power and equipment of the Chicago &

Western Indiana, and of the Belt Railway, to consider the smoke problem in Chicago. The utility and availability of various smoke eliminating devices were discussed, and the consideration of the plan of educating the men, which has been adopted by the Belt Railway, enabling them to greatly reduce the amount of smoke made and at the same time consume less fuel per unit of tonnage, was the most interesting feature of the meeting. During the last six months, compared with the corresponding six months of 1910, a reduction of approximately 55 per cent. was effected by the Belt Railway in the amount of dense smoke made, and during that time there was an increase in tonnage and a considerable reduction in the cost of fuel. In performing this increased work, in keeping with the city ordinance, the engines on this road have actually burned 8,318 tons less fuel than in the corresponding six months of the previous year. Mr. Wardwell attributes this great improvement largely to the education of the firemen and enginemen in the proper firing and handling of engines. Railway men and city officials present at the meeting agreed that education of the men is the largest part of the problem of eliminating smoke. The Belt Railway operates entirely within the city limits, which increases the difficulty of its smoke problem. Every one of the engines operating on it must be fired continually within the city limits, and, therefore, must constantly be in danger of violating the smoke ordinance.

Canadian Pacific Steamships.

An officer of the Canadian Pacific is quoted as saying that the company has ordered two steamships for the Vancouver-Hong Kong service to cost $5,000,000, from the Fairfields Ship Building Company of Glasgow, Scotland. The steamships are to be 595 ft. long, and will be required to maintain an average of 18 knots an hour. They are to be ready in January, 1913.

Conservation in Small Things.

The general manager of the Chicago Great Western has issued a bulletin to all employees, entitled "Conservation." He says in part:

"A penny saved is a penny earned," applies to individuals and corporations alike. The opportunity of a personal inspection of our railway housekeeping during the past few weeks has convinced me that we must begin, and at once, to *earn by saving*. Thousands of dollars' worth of property, belonging to the company, is lying useless for want of a little care, and a trifling outlay for repairs. One illustration will suffice: Twelve dozen hand lamps were collected, which, when sent to the general storekeeper's department, were found to need possibly an average of five cents' worth of repairs to make them again as good as new. It will not be necessary to replace them with new lamps.

In ten days, four carloads of surplus material were reclaimed.

It is my personal request that every employee join with me in this conservation movement. Make it a personal matter to make a systematic inspection of all material on hand—tools, stationery forms, empty ink bottles, etc. Anything that is of no immediate use in your department, tag and send to the general storekeeper, or deliver to the supply car when it reaches your station, with exception of stationery and ink bottles which are to be sent to the stationery storekeeper at Chicago.

"Scrap" should be picked up and assembled at some central point, where it can be conveniently and cheaply loaded for disposal. Tools when worn out have a certain value, and should be turned in. True economy is not parsimony, and when by our individual efforts each employee aids in thus "picking up" the company's money, as he would if he saw a penny, a nickel, a dime or a dollar in his way, we are sure there will be a good showing of *dollars saved* by our knowledge and practice of the principles of conservation.

The bulletin also gives a list of prices of things used by station agents, enginemen, trainmen, bridgemen and section men. This price list gives the new value, second-hand value and scrap value of each article. The startling difference in these values should serve as a great incentive to employees to conserve all material possible. For example, a coupler having a value of $9 new is worth $7.50 second hand, and $1.80 as scrap. A ball-bearing jack, which cost $12 new, is worth $11.10 second hand, and only thirty cents as scrap.

The B. R. & E. Decision.

The New York State Public Service Commission, Second district, has won public confidence. It does an enormous amount of work, does it expeditiously, is reasonable in expenditures and is fair to the corporations and fair to the people. A committee from the Illinois legislature has lately made a report confirming this view, being impressed with the total divorcement of the commission from politics, as well as with its absolute independence.

The statement that interior cities are disappointed at the refusal of the commission to authorize the construction of the Buffalo, Rochester & Eastern is not warranted. The proposed road was to pass north of Rochester, and there is no regret in Rochester. The *Syracuse Herald* says that the judgment of the commission will be contemplated with equanimity. The *Utica Observer* looks upon the action of the commission as broad and wise. The *Buffalo Express* shows that Buffalo does not regret that the road is not to be built. The *Troy Press* and the *Troy Times* both treat the subject lightly.

Governor Dix expected last January to send to the legislature a special communication in regard to the commission, but this communication never came, and it seems likely that the governor found upon inquiry that the commission was all right.—Condensed from *Rochester Post-Express.*

The Demands of the Western Shopmen.

The demands of the machinists, boilermakers, blacksmiths, sheet metal workers and other shopmen presented to the officers of the Southern Pacific on August 1, were noticed in our issue of August 11, page 294. The demands were presented August 1 and answer was asked for in 30 days. The conciliatory action of the Illinois Central and the Rock Island, to which companies similar claims were presented, appears to have resulted in a lull in the agitation, at least in the newspaper agitation; and the laying off of large numbers of men from some of the shops of the Union and the Southern Pacific also seems to have affected the attitude of the shop men. The affiliation of the different trades above-named appears to be still incomplete, though so far as the Harriman lines are concerned, the "System Federation," formed at a convention at Salt Lake City in June, appears to have been fully organized. The convention appointed a general advisory board composed of thirty-six members, with E. L. Reguin, of San Francisco, as president; J. E. Crouch, of Sacramento, vice-president, and John Scott, of San Luis Obispo, secretary. Mr. Reguin is a lawyer as well as a machinist, and has been labor commissioner of San Francisco.

The rules which the shopmen propose for the shops of the Harriman Lines and which they presented to the Southern Pacific Company in the shape of a demand, are given below. Mr. Small, general superintendent of motive power of the Southern Pacific at San Francisco, says that the demands, if granted, would increase the annual expenses in his shops—that is, on the Pacific system alone—$2,976,000. Mr. Small says that within the last five years all of the craftsmen in the shops have had their pay increased, averaging 12½ per cent.; and, furthermore, the rates paid are higher than in the shops of any other railway in the country. On the Southern Pacific lines in Texas the increases demanded would mean an addition to expenses of $500,000; and the men there have had even higher increases than have those in California.

Shopmen of the Illinois Central tell the reporters that a "strike vote" is being taken throughout that system.

PROPOSED RULES GOVERNING SHOP EMPLOYEES, HARRIMAN LINES.

Rule 1. *Work Day.*—The standard working time shall be eight hours per day and six days per week. The working hours shall be from 8 a. m. to 12 noon; from 1 p. m. to 5 p. m. Night forces on a corresponding basis. Night men shall be allowed nine hours' pay for 8 hours' work. There shall be no lap shift worked. Working hours shall be bulletined. Where continuous service is necessary, three shifts may be worked as follows: 8 a. m. to 4 p. m., 4 p. m. to 12 midnight, 12 midnight to 8 a. m. Twenty minutes to be allowed each shift for lunch, with pay. All employees will be allowed one hour with pay at the close of the week, irrespective of the number of hours worked.

Rule 2. Reduction of Expenses.—When any reduction of expenses is to be made, employees shall first have the privilege of a

ninety-day leave of absence. If any further reduction is necessary, the last man hired within the jurisdiction where the reduction is to be made, shall be given a ninety-day leave of absence, or until such time as forces are to be increased, when the last man given leave of absence shall be the first man put back to work. Men granted leave of absence shall be furnished with transportation over the Harriman lines. Committee shall be notified by foreman that the services of employees are again required, and employees on leave of absence shall be given ten days to return to work.

Rule 3. *Overtime.*—All time worked other than bulletined hours shall be considered overtime. Overtime shall be paid for at the rate of time and one-half up to midnight. After midnight double time shall be paid until relieved. No employee shall work longer than one hour without being allowed time for meals. Employes required to work after bulletin hours shall be paid four hours for two hours and forty minutes' service or fraction thereof, if worked before midnight. If after midnight, they shall be paid four hours for two hours or fraction thereof. Sundays and all holidays, designated by the State or Nation, shall be paid for at the rate of time and one-half. Holidays falling on Sundays and another day observed by the State or Nation, this day shall be considered a holiday and paid for as such. No employee shall be required to work overtime more than two nights per week, or two consecutive Sundays. When overtime is required it shall be distributed. Employees shall not be laid off from regular working hours to equalize overtime worked. Overtime shall be confined to emergency cases. Men transferred from one shift to another shall be paid overtime for the first night or day, as the case may be. Employees when sent out on the road from their home station shall receive continuous time from the time called until the time they return, as follows: Overtime rates for all overtime hours, whether waiting, traveling or working, and straight time for what are straight time hours at the home station, whether waiting, traveling or working, with an allowance of $1.50 per day for expenses, provided that when away for a period of thirty-six hours, and have been given time for sleep and rest, that the regular rule for time and overtime shall apply thereafter. Expense money to be paid on the following day, except in the case of employee leaving the service of the company, he shall be paid at the time of leaving service.

Rule 4. *Definition of Work.*—All crafts must insert their definition of work in this rule.

Rule 5. *Competency.*—Competency of the employees entering the service shall be determined within thirty days.

Rule 6. *Employment.*—Employees shall not be requested to undergo any form of physical examination, or make out any form of personal record.

Rule 7. *Safeguarding Employees.*—Men shall not be required to work on engines outside of shop in bad weather. This not to apply to work in engine cabs. Before work on engines undergoing repairs in shops and roundhouses is distributed, it shall be cleaned. Roundhouses shall be piped or otherwise arranged so that when the engines are being blown down, the steam will be carried from the roundhouse, and the danger eliminated. This work to be completed within ninety days after the signing of this agreement.

Rule 8. *Apprentices.*—There may be one apprentice to every five mechanics in the shop. No apprentice shall be allowed to serve his apprenticeship where there are not proper facilities for learning the trade. Apprentices must know the first four rules of arithmetic, and be able to read and write the English language. If within six months an apprentice shows no aptitude to learn the trade, he shall be transferred or released from the service. Shop foremen and shop committee shall be the judges in the case. Apprentices shall be subject to same regulations as mechanics unless otherwise stated in this agreement. Apprentices shall not be permitted to work nights and over time, neither shall they be sent out on the road. When force of mechanics are reduced, the number of apprentices shall be reduced to maintain ratio (except apprentices employed previous to this agreement), seniority to govern in their reduction and re-employment. At the expiration of their apprenticeship, if retained in the service of the company, they shall receive the rate of pay paid mechanics at that point. (Note—All crafts must insert special rule on apprentice question following the above.)

Rule 9. *Discharge and Suspension.*—No employee shall be discharged or suspended without a just and sufficient cause. If after due investigation it is found that an employee has been unjustly discharged or suspended, he shall be reinstated with full pay for all time lost, investigation to take place within five days after date of his suspension or dismissal. Before discharge or suspension takes place, foreman shall notify employee and committee; in case of any doubt, employee shall be left at work pending investigation.

Rule 10. *Adjustment of Grievances.*—It is understood in the adjustment of grievances the officials of the company will receive a duly authorized committee to act in the premises at any time. Grievances shall be first submitted to shop foreman, and in the event of his decision being unsatisfactory, an appeal may be taken by the committee and their duly authorized representatives to the higher officials. The company will not in any way discriminate against employees who are called upon at any time to serve on any committee or to act in the adjustment of grievances, and shall grant leave of absence and free transportation to those delegated to go before the management in the adjustment of grievances. Transportation shall be granted to employees representing their organization to all conventions or meetings.

Rule 11. *Sanitation.*—Special efforts shall be made to furnish good ice-water for drinking purposes, and all pits and floors in shops and roundhouses shall be maintained in a dry, clean, sanitary and safe condition. Proper toilets shall be provided at all points, enclosed from public view, the doors of which shall be kept closed. Also a suitable place for washing purposes.

Rule 12. *Time Checks.*—Employees leaving the service of the company shall be furnished with a time check covering all time due within twenty-four hours at all division points where time checks are issued, and forty-eight hours at all other points. When employees are being paid it shall be during working hours, night men excepted.

Rule 13. *Relief Service.*—When an employee at any of the outlying points requests leave of absence and transportation, same shall be granted. Employees shall give ten days' notice to proper officer of the company. Before the expiration of notice another employee shall be sent to relieve applicant.

Rule 14. *Transportation.*—Employees and dependent members of their families and employees' representatives of the mechanical department shall enjoy the same privileges in regard to free transportation as that now granted employees and their representatives of the operating department.

Rule 15. *Associates.*—Employees now and hereafter employed and not members of the association represented as the second party in this agreement shall have thirty days in which to obtain membership.

Rule 16. *Promotion.*—When vacancies occur in shop foremanships, the company shall consider mechanics of the craft in the shop where vacancy occurs for promotion to foremanship, seniority to govern.

Rule 17. *Special Consideration.*—Employees who by long and faithful service for the company have become unable to handle the heavy work to an advantage, will be given preference of such light work as they may be able to handle without any reduction in their rate and without any discrimination.

Rule 18. *Hospital Department.*—Employees injured or becoming sick while in the service shall, if necessary, be sent to hospital for treatment, such treatment to be given free of charge as long as the patient and members of his organization think he requires it. Hospital Department shall furnish financial statement of receipts and expenditures to be given employees at least once a year. Employees shall be given equal membership on the Board of Directors of the Hospital Department.

Rule 19. *Wages.*—All work performed shall be paid for by the hour. All mechanics, apprentices and semi-skilled men and helpers shall be granted a seven-cent flat increase per hour. No employee shall be employed for less than the established minimum rate of pay paid at that point. No employee shall work by piece, premium or bonus system. Where same is now in existence, it shall be discontinued upon the signing of this agreement.

Rule 20. *Change of Rules.*—These rules and regulations, with rates of pay, shall supercede all others, and shall take effect when signed by contracting parties, and remain in effect until changed by either party giving thirty days's notice in writing to the other party, during which time a conference shall take place. A copy of these rules and regulations shall be posted on bulletin boards in shops and roundhouses and shall remain in force until superseded by another agreement.

Organization of Missouri Pacific's Claim Department.

Under the new organization of the claim department of the Missouri Pacific, which became effective August 14, as was announced in the *Railway Age Gazette* of August 11, page 293, the general claim agent, who has his office at St. Louis, and who will be a member of the office staff of the vice-president and general solicitor, will exercise general supervision over the conduct of all matters of business pertaining to the claim organization. Under the supervision of the vice-president and general solicitor, he will authorize the settlement of, or settle direct, important cases in which the amount to be paid exceeds the limitations within which claims may be settled by the district claim agents under the supervision and authority of the chief officers in the law department of their respective districts. The office of the general claim agent will also act as a clearing house for the various district claim agents' offices, proper records being kept of all vouchers issued in settlement of claims, and monthly reports being made to the vice-president and general solicitor.

The location of district claim agents, with territory under the jurisdiction of each, are as follows:

St. Louis, Mo., in charge of St. Louis terminals in Missouri, Kirkwood to Carondelet; Sedalia, Mo., in charge of lines in Missouri west of Kirkwood, exclusive of Jackson county; Poplar Bluff, Mo., in charge of lines in Missouri south of Carondelet; East St. Louis, Ill., in charge of all lines in Illinois; Atchison, Kan., in charge of lines in Kansas, Nebraska and Colorado; Kansas City, Mo., in charge of Kansas City terminal division, all other lines in Jackson county, Mo., and lines from Atchison to St. Joseph, Mo.; Little Rock, Ark., in charge of all lines in Arkansas and Oklahoma; Monroe, La., in charge of all lines in Louisiana.

District claim agents, besides having charge of investigation and settlement of claims arising within their respective districts, will, when located at points where company hospitals are maintained, so far as practicable, handle the cases of all persons receiving treatment at such hospitals, under the direction of the principal officer of the law department in their districts and of the general claim agent. Assistant claim agents and stock claim agents will be appointed to assist district claim agents where conditions require such appointments. Operating department reports on prescribed forms will be furnished to the district claim agent regarding each accident or injury in the different districts, and in cases of serious injuries to employees, passengers and other persons, investigations will be made promptly under the direction of the district claim agent. Telegraph reports of accidents are to be made to the general claim agent and to the district claim agent in charge of the district where the accident occurs. Revised forms for engineers' reports of stock struck by locomotives are furnished and must be carried on each engine engaged in road service, the engineer being expected to fill out and file reports of all stock struck at the end of each run.

Work and Wages.

The Union Pacific has ordered reductions of forces and shortening of working hours at its principal shops. Similar retrenchment orders appear to have been given on the Southern Pacific in the Pacific states and in Texas. Men have been laid off also at some of the freight houses.

The Chicago, Peoria & St. Louis has made an increase of two cents an hour in the pay of boilermakers—from 34 cents to 36 cents.

The Texas & Pacific has reopened its shops which had been closed for two weeks. The Chicago & Alton has ordered its shops at Bloomington to be run to their full capacity.

The shop men of the Canadian Pacific west of Lake Superior are reported to be taking a vote on the question of striking, if they do not receive an increase in pay.

The firemen of the Lehigh & Susquehanna division of the Central of New Jersey have received an advance in pay.

Organization of Mechanical Department, St. Louis & San Francisco.

Effective August 15, a change has been made in the operation of the mechanical department of the St. Louis & San Francisco, by which, as stated in an official circular:

"General superintendent motive power will report to the general manager. He will have general charge of motive power, equipment and machinery; will direct all locomotive repairs described as Classes 1, 2, 3, and 4, and be responsible for boiler inspection and condition of locomotives, machinery and cars at all points. He will prescribe standards and see that all work is done in accordance therewith. He will keep all locomotives and car statistics, and handle all M. C. B. accounts, bills and vouchers.

"The general superintendent motive power will have charge of the operation of the shops and car works in Springfield, Kansas City and Memphis.

"The general superintendent will report to the general manager and be charged with the performance of all motive power, machinery and car work at all points excepting the operation of the shops and car works in Springfield, Kansas City and Memphis.

"Superintendents will report to general superintendents on all matters not specified above as coming under the jurisdiction of the general superintendent motive power, and will report to the general superintendent motive power on all matters specified above as coming under the jurisdiction of that official.

"Mechanical superintendents will report to the general superintendents and will advise with the superintendent on each division as to all mechanical department matters, excepting those at the shops in Springfield, Kansas City and Memphis.

"All shops, car works and mechanical department matters, excepting the operation of the shops and car works in Springfield, Kansas City and Memphis, will be under the jurisdiction of the master mechanics, who will report to the superintendents on their respective divisions."

The British Railway Strike.

The British railway labor unions carried out their threat last week to strike, though not until twenty-four hours or more after the hour which they had set, the leaders having continued in conference with representatives of the government up to Thursday night. The men finally went out on Friday, the 18th, and, according to their leaders, 200,000 responded to the order. At Liverpool, where the strike of dockmen also helped to paralyze traffic, the movement of trains was almost entirely suspended, but elsewhere the companies succeeded in keeping some of their passenger trains moving. Suburban travelers, however, suffered very serious delays. The Metropolitan Railway of London reduced its train service only about one-third. Press dispatches reported the strike as fairly effective in the north of England and in South Wales, but unsuccessful in the south of England. The Northeastern Railway suffered seriously. Reports are very contradictory and some of the newspapers even claimed that the strike was a fiasco.

The government quickly provided military protection at all important points. There were 50,000 soldiers on duty in London, and 8,000 at Llanelly, Wales. There was rioting at Birmingham, Derby, Sheffield and Llanelly. At Llanelly the soldiers, in subduing the riots, shot and killed two of the rioters. A mob set fire to a freight house and there followed an explosion in which several persons were killed. In Ireland some of the trainmen left their work, but, apparently, not a large proportion of the whole.

On the London & Northwestern a large proportion of the men remained loyal to the company and 600 clerks were assigned to duty at signal cabins and other places. The company issued a manifesto, thanking its employees and announcing that all who refused to strike would be given double pay during the strike period. Other companies made similar offers, but not so liberal. The suspension of freight traffic on the Great Northern compelled the fishermen on the north and east coasts to stop work.

The movement of passenger trains was much better on Saturday than on Friday, but the government, particularly Mr. Lloyd George, Chancellor of the Exchequer, kept up its efforts at peacemaking, and before midnight on Saturday it was announced that a settlement had been arrived at; and on Sunday the great majority of the strikers returned to work. The principal feature of the agreement was that the railways virtually abandoned their claim, never before modified to an appreciable degree, that the negotiators for the men must be their own employees; in other words, the railways, for the first time, agreed to meet the representatives of the brotherhoods as such. The agreement provided that the leaders of the men should induce them to return to work at once, that all should be re-instated, no one to be made to suffer for breach of contract; that conciliation boards should be convened at once; that employees of those classes not in-

cluded in the conciliation scheme of 1907, should have their grievances attended to, and that the interpretation of the agreement, if questions should arise, should be referred to the Board of Trade.

The agreement, as printed in the newspapers, is not entirely clear, but the representatives of the government repeatedly stated, in explicit terms, that the railways had agreed to have representatives meet the representatives of the employees face to face.

By Sunday considerable progress had been made in moving freight. On Monday it appeared that the strikers on the London & Northwestern had not returned to work and the Board of Trade was occupied all day in negotiations to settle this difficulty. There was a good deal of friction when the strikers returned, and scenes of disorder were reported on the Midland Railway and elsewhere. Large numbers of porters and freight handlers at Manchester refused to resume work.

The strike of dockmen at Liverpool not only aided in tying up railway traffic but delayed for a number of days most of the important transatlantic steamships. Disturbance of shipping was so extensive that exporters in New York City were put to much inconvenience and their shipments delayed. There was much difficulty at Liverpool as late as Tuesday of this week, the city refusing to reinstate 250 employees of the street car lines. In consequence of this, railway men and dockmen made further trouble.

The commission appointed to inquire into the questions at issue between the railways and their employees was announced in the House of Commons on Tuesday as follows: Chairman Sir David Harrel, who was Under Secretary for Ireland, 1893-1902. To represent the railways, Sir Thomas R. Ellis, Secretary of the Mine Owners' Association, and Sir Charles G. Beale, Vice-Chancellor of the University of Birmingham; to represent the employees, Arthur Henderson, labor member of Parliament, and John Burnett, chief labor correspondent of the Board of Trade.

Traveling Engineers' Association.

The annual meeting of the Traveling Engineers' Association will be held at the Sherman House, Chicago, August 29 to September 1. At the opening session on the morning of August 29, addresses will be delivered by Robert Quayle, general superintendent of motive power of the Chicago & North Western; and by C. E. Thayer (Southern Railway), president of the association. Routine business will then be transacted, after which there will be presented the report of the committee on the Value of Actual Demonstration as Compared with Oral Instruction in Air Brake Operation, J. B. Kelley, chairman. On Tuesday afternoon, August 29, there will be a report of the Committee on The Value of Practical Instruction in Fuel Economy. On Wednesday, August 30, there will be a report of the Committee on Proper Methods to Be Observed in the Efficient Handling of the Electric Locomotive, by S. A. Bickford, chairman. There will also be an address by F. O. Melcher, vice-president of the Rock Island Lines, and one by A. W. Whitford on the Jacobs-Shupert firebox. In the afternoon there will be a report of the Committee on the Latest Development and Improvements in Automatic Stokers, by J. R. Lucky, chairman, and a report of the Committee on the Mallet Compound Engine in Road Service, by J. B. Daugherty (B. & .O.). On Thursday, August 31, there will be an address by T. A. Foque, general mechanical superintendent of the Minneapolis, St. Paul & Sault Ste. Marie. A report of the Committee on Lubrication of Locomotives Using Superheated Steam, by M. H. Haig (mechanical engineer of the Atchison, Topeka & Santa Fe), chairman, and a report of the Committee on Benefits Derived by the Use of the Brick Arch, by W. G. Tawse, chairman. On Friday, September 1, there will be an address by Samuel O. Dunn (*Railway Age Gazette*), followed by a report of the Committee on Increased Efficiency of Locomotives and Benefits Derived from Chemically Treated Water, by A. C. Kinyon, chairman; a report of the Committee on Subjects for Discussion, 1912, by W. C. Hayes (Erie), chairman; a report of the Committee on Change in Constitution and By-laws, by D. Meadows (Michigan Central), chairman. There will follow the election of officers, the selection of place of next meeting and adjournment.

The exhibit of the supply manufacturers will be the best that has ever been given in connection with a convention of this association. All of the 3,800 ft. of space has been sold. The arrangement of the booths will be similar to that of the exhibit at Atlantic City. The supply manufacturers have also prepared an attractive entertainment programme. There will be a reception and ball at the Sherman House on the evening of August 29. On the morning of August 30 the ladies will be given a ride about the city in automobiles provided for the purpose. At night a ride will be given to members and guests of the association on the steamship Theodore Roosevelt, on which occasion there will be music and dancing. On the evening of August 31 a vaudeville entertainment will be given at the Colonial Theatre, which has been hired especially for that purpose and to which no one will be admitted but members and guests of the association. In addition to the regular vaudeville programme, a sketch which has been prepared for the occasion will be presented. Invitations to attend the convention have been sent not only to members of the association, but to every railway purchasing agent, master mechanic and superintendent of motive power in the United States.

General Passenger and Ticket Agents.

At the annual convention of the American Association of General Passenger and Ticket Agents, to be held at the St. Paul Hotel, St. Paul, Minn., September 19, reports will be received from the Standing Committee on Association Ticket Paper; from the Standing Joint Committee of the American Association of General Passenger and Ticket Agents, and the Association of American Railway Accounting Officers; from the Standing Committee on Standard Ticket Contracts; from the Special Joint Committee of the American Association of General Passenger and Ticket Agents and the American Railway Accounting Officers, relative to Uniform Interline Tickets and Minimizing the Use of Exchange Orders. Reports will also be received from the co-operating associations, including the Association of American Railway Accounting Officers, the American Association of General Baggage Agents, the Canadian Ticket Agents' Association, the American Association of Traveling Passenger Agents and the International Association of Ticket Agents. There will be an address by W. J. Craig, passenger traffic manager of the Atlantic Coast Line. C. M. Burt, Boston, Mass., is secretary.

Old Time Telegraphers' and Historical Association.

The Old Time Telegraphers' and Historical Association will hold its thirtieth annual reunion at Atlantic City, N. J., September 5, 6 and 7. The headquarters will be at the Marlboro-Blenheim Hotel. The president of the association is Col. William B. Wilson, Holmesburg, Pa.; secretary, F. J. Scherrer, 30 Church street, New York City. Col. Wilson is also president of the Society of the United States Military Telegraph Corps, which meets at the same time.

Central Railway Club.

The annual fall outing of the Central Railway Club will be held on September 8. The party will leave Buffalo in the morning and go down the river on a boat to the Island Club. After dinner there will be a business session, at which J. P. Murphy, Collinwood, Ohio, general storekeeper of the Lake Shore & Michigan Southern will present a paper on Conservation of Waste. Harry D. Vought, New York, is secretary.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 75 Church St., New York; November 15, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago; annual convention, March 19-21, 1912, Chicago.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; annual, June 26, 1912, Quebec, Que.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; annual convention, May 22, 1912, Los Angeles, Cal.
ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; annual, November 6-10, Chicago.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; annual, June 24, 1912, New York.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York; December 12-13, Louisville, Ky.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLead, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; annual Buffalo, N. Y.
GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.
MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn; 4th Saturday, Duluth.
OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; annual, May 12, 1912, Kansas City, Mo.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; annual, Oct. 10, Colorado Springs, Colo.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.
RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; annual, October 20, Atlanta, Ga.
SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 18, 1912, Louisville, Ky.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago; annual, January 16-18, Chicago.

Traffic News.

The Memphis Freight Bureau has complained to the Interstate Commerce Commission that express rates from eastern cities are much higher to Memphis than to St. Louis, and that they are excessive as compared with freight rates.

The office of general western agent of the Central-Savannah (freight) Line, at St. Louis, has been abolished, and correspondence relating to Central-Savannah Line solicitation in that territory should be sent to the general agent of the Central of Georgia, Pierce building, St. Louis.

The Baltimore & Ohio is this week running on its lines in Ohio an "agricultural educational train." The train is in charge of the industrial department of the road and carries lecturers from the State Agricultural College, who will discuss corn and wheat cultivation, drainage and seed selection.

The Chicago, Milwaukee & St. Paul, and the Chicago, Milwaukee & Puget Sound are making a special second class harvest labor rate of $12 one way from St. Paul, Minn., and intermediate points to stations in Montana on the line of the Puget Sound. The tickets, which are limited to three days and are not to be honored in standard or tourist sleeping cars, were on sale August 17, 19, 22 and 24, and will be on August 26, 29 and 31.

INTERSTATE COMMERCE COMMISSION.

The commission has suspended from August 18 to December 16, certain tariffs on fresh meat and packing-house products from points in Texas and the southwest to eastern and northeastern points.

The commission has authorized the Virginian Railway to establish a rate of $1.65 a ton on coal from West Virginia to Washington, D. C., in disregard of the long-and-short-haul rule of the law; this to meet the competition of a short line.

STATE COMMISSIONS.

The Indiana Railway Commission has denied the right of the railways operating in that state to raise the minimum freight charge from 25 cents to 35 cents on intrastate shipments.

Complying with a law passed this year by the Minnesota legislature, the railway commission of that state will on August 31 take up the subject of making general rules to fix the percentage relation to govern in making joint rates between common carriers for the transportation of freight and express in carload and less-than-carload lots, will also take up the subject of making rules necessary to govern in the transfer of freight and express between carriers. Persons interested in these matters are invited to offer suggestions to the commission.

The Indiana State Railroad Commission has issued orders exempting from the requirements of the block signal law the following companies, each order referring to a line on which the commission accepts the plea that the business is not sufficient to warrant the expense of introducing and maintaining the block system: Cincinnati, Hamilton & Dayton, on the line west of Indianapolis and on the Fort Wayne division; Chicago, Indianapolis & Louisville, Monon to Michigan City, Wallace Junction to Victoria, Orleans Junction to French Lick and Bedford to Switz City; Lake Erie & Western, Kokomo & Michigan City division and the Fort Wayne, Cincinnati and Louisville division, including the Rushville branch. The commission has refused to extend until July 1, 1913, the time within which the Michigan Central shall make its block system uniform throughout the state of Indiana. The work must be done by next January.

COURT NEWS.

In the United States district court in West Virginia, last week, the Norfolk & Western announced that it would not contest the suits brought against it by the government for violation of law, in running trains on steep grades without a sufficient number of air brakes in use to comply with the statute.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

F. B. Bowes, vice-president in charge of traffic of the Illinois Central, with office at Chicago, has been elected also third vice-president in charge of traffic of the Yazoo & Mississippi Valley.

F. C. MacMillan, formerly general manager at Des Moines, Iowa, of the St. Paul & Des Moines, which since its purchase by the Rock Island is to be known as the St. Paul & Kansas City Short Line, has been appointed vice-president and general manager of the latter road, with office at Des Moines.

Briton I. Budd, formerly president and general manager of the Metropolitan West Side Elevated Railway, has been chosen president of the Chicago Elevated Railways, the new company which has absorbed the four Chicago elevated roads and the union loop.

George P. Herzinger has been appointed district claim agent of the Missouri Pacific, with office at Atchison, Kan. This completes the list of district claim agents appointed under the new organization of the claim department, the other appointments having been announced in our issue of last week. See item in General News Section, page 385.

Operating Officers.

G. Geiger, assistant division superintendent of the Southern Pacific at Sacramento, Cal., has been appointed superintendent of the Copper River & Northwestern, with office at Cordova, Alaska.

E. C. Noe, general manager of the Northwestern Elevated Railroad and the Chicago & Oak Park Elevated Railroad in Chicago, has been appointed general superintendent of the new Chicago Elevated Railways.

T. H. Williams, assistant division superintendent of the Southern Pacific at Stockton, Cal., has been appointed assistant division superintendent, with office at Sacramento, Cal., succeeding G. Geiger, resigned to accept service with another company. W. H. Stillman, trainmaster of the Shasta division, succeeds Mr. Williams, and V. S. Burnham succeeds Mr. Stillman.

E. E. Lille having resigned as superintendent of car service of the Spokane, Portland & Seattle, the Oregon Trunk Railway, the Oregon Electric Railway and the United Railways Company, that office and the office of superintendent of telegraph of these companies are abolished, and the duties of those offices will be assumed on the Spokane, Portland & Seattle and the Oregon Trunk Railway by J. Russell, general superintendent; and on the Oregon Electric and United Railways, by C. A. Coolidge, general manager.

O. C. Castle has been appointed car service agent of the Galveston, Harrisburg & San Antonio, the Texas & New Orleans, Morgan's Louisiana & Texas Railroad & Steamship Company, the Louisiana Western and the Iberia & Vermilion, with office at Houston, Tex., succeeding R. P. Granger, resigned. Mr. Castle was born at West Brownville, Pa., on January 22, 1874, and received his education in the common schools of Cuyahoga Falls, Ohio. He began railway work in 1893 in the telegraph department of the Pennsylvania Lines, and became an assistant chief clerk in the office of the superintendent of car service of the Baltimore & Ohio in 1900, two years later becoming stenographer and statistical clerk in the office of the general manager. In 1903 he was appointed chief clerk to the superintendent of the Butler division, and for three years from 1904 was chief clerk to the superintendent of the Pittsburgh division. Since 1907 he has been with the American Railway Association as statistician for the committee on relations between railways.

Traffic Officers.

J. D. Gowin has been appointed commercial agent of the Fort Worth & Denver City, with office at Dallas, Tex.

W. K. Wimberly has been appointed traveling freight and passenger agent of the Opelousas, Gulf & Northeastern, with office at New Orleans, La.

A. W. MacElveny, traveling freight agent of the St. Louis & San Francisco at Houston, Tex., has resigned to accept service with the Atchison, Topeka & Santa Fe.

O. M. Ellsworth, general agent in the freight department of the Rock Island Lines at Pittsburgh, Pa., has been appointed general eastern freight agent, with office in New York City, succeeding F. B. Mesick, retired. T. W. Bennett, commercial agent at Louisville, Ky., succeeds Mr. Ellsworth.

W. A. Scrivner, commercial agent of the Trinity & Brazos Valley at Forth Worth, Tex., has been appointed division freight agent of the Texas & Pacific, with office at El Paso, Tex. R. H. Carrington, general agent at El Paso, has been assigned to other duties, and the office of general agent at that place has been abolished. G. L. Moore has been appointed commercial agent, with office at Oklahoma City, Okla.

N. M. Leach, traffic manager of the Texas & Pacific and the International & Great Northern, has had his office moved from San Antonio, Tex., to New Orleans, La. Frank Koch, assistant general freight agent of the International & Great Northern at Palestine, Tex., has been appointed assistant to the traffic manager of that road and the Texas & Pacific, with office at New Orleans. J. D. Webb, traveling freight agent of the Texas & Pacific at Dallas, Tex., has had his jurisdiction extended over the International & Great Northern.

Engineering and Rolling Stock Officers.

G. W. Hegel, principal assistant engineer of the Chicago Junction Railway at Chicago, has been appointed chief engineer, with office at Chicago.

M. Dailey has been appointed master mechanic of the Bellingham Bay & British Columbia, with office at Bellingham, Wash., succeeding W. J. McLean, resigned.

F. E. Phillips, assistant chief engineer of the Grand Junction & Grand River Valley, has been appointed chief engineer, with office at Grand Junction, Colo., succeeding E. L. Mosley, resigned to go to the engineering department of the Canadian Pacific.

A. M. Lupfer, chief engineer, and J. B. Ingersoll, chief electrical engineer, of the Spokane & Inland Empire, both with offices at Spokane, Wash., have resigned, and the engineering department has been moved to Portland, Ore., where it will be in charge of R. Budd, chief engineer of the Spokane, Portland & Seattle.

W. H. Fenley, formerly signal engineer of the Chicago Great Western, and lately connected with the Union Switch & Signal Company, has been appointed signal engineer of the Panama Railroad, with office at Colon, Canal Zone. He will sail from New York next week, his appointment becoming effective September 1.

H. Honaker, assistant master mechanic of the St. Louis & San Francisco at Memphis, Tenn., has been appointed master mechanic, with office at Birmingham, Ala. L. E. Foote, road foreman of equipment at Francis, Okla., has been appointed master mechanic, with office at Francis, and J. J. Shaw, division foreman at Enid, Okla., has been appointed master mechanic at Enid. William Henry, master mechanic at Monett, Mo., has been transferred with the same title to Neodosha, Kan. J. F. Long, general foreman of shops at Sapulpa, Okla., has been appointed master mechanic, with office at Sapulpa, succeeding A. S. Abbott, promoted, and B. A. Beland, roundhouse foreman at Springfield, Mo., has been appointed master mechanic, with headquarters at Fort Scott, Kan. See item under General News Section regarding a change in the organization of the mechanical department.

OBITUARY.

John G. Jennings, superintendent of telegraph of the Chicago, Rock Island & Pacific, with office at Chicago, died in Chicago on August 20. Mr. Jennings was born June 4, 1862, at Bellaire, Ohio. He began railway work with the Pennsylvania Lines of West Pittsburgh in 1878, having been successively messenger, yard clerk, operator, train despatcher and chief despatcher with that road. He was superintendent of telegraph of the Chicago, Rock Island & Pacific from 1904 to the time of his death.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The St. Louis & San Francisco is said to have placed an order for 20 locomotives with the American Locomotive Company. This item is not confirmed.

Kansas City Southern, mentioned in the *Railway Age Gazette* of March 10 as being in the market for 29 locomotives, is expected to place this order within a few days.

The Lehigh & New England has ordered two consolidation locomotives from the Baldwin Locomotive Works. The dimensions of the cylinders will be 19 in. x 26 in.; the diameter of the driving wheels will be 50 in., and the total weight in working order will be 145,000 lbs.

CAR BUILDING.

The Detroit United Railways have ordered 50 double truck city cars from the Kuhlman Car Company.

The St. Louis & San Francisco is said to have ordered 250 flat cars from the American Car & Foundry Company. This item is not confirmed.

The Queen & Crescent is said to be taking prices on 22 steel coke cars, 159 steel gondola cars and 175 steel hopper cars. This item has not been confirmed.

The Havana Central, mentioned in the *Railway Age Gazette* of August 18 as being in the market for coal cars, is in the market for 75 all steel 30-ton coal cars.

The Florida and East Coast is in the market for two 60-ft. all steel postal cars, four 70-ft. all steel express cars, two 70-ft. all steel combination cars, and eight 70-ft. all steel coaches.

The Baltimore & Ohio, mentioned in the *Railway Age Gazette* of August 4 as being in the market for a number of baggage cars and postal cars, is in the market for ten 70-ft. baggage cars, five 70-ft. postal cars and five 60-ft. postal cars.

IRON AND STEEL.

The Chesapeake & Ohio is making inquiries for 2,000 tons of bridge material.

The Wabash has ordered 2,500 tons of Bessemer rails from the Illinois Steel Company.

The Wichita Falls Route has ordered 10,000 tons of Bessemer rails from the Illinois Steel Company.

The Chicago & Western Indiana has ordered 1,200 tons of structural material for track elevation at South Chicago from the Mt. Vernon Bridge Company.

The Butte Anaconda & Pacific has ordered 4,000 tons of rails from the United States Steel Corporation. These rails will contain 1/10 of 1 per cent. metallic titanium.

General Conditions in Steel.—The shrinkage in orders due to the depression in Wall street is very much smaller than was expected. The Steel Corporation is receiving orders at the rate of over 30,000 tons a day. Rail orders have been very small, but contracts for fabricated steel have been unusually heavy. Steel men are satisfied with the outlook.

SIGNALING.

It is planned to equip the entire Panama Railroad with automatic block signals and to install interlocking plants at all points requiring the protection and facility of operation which they afford.

Supply Trade News.

H. R. Safford has been made chief engineer of the George B. Swift Construction Company, Chicago.

Hiram Oldershaw, secretary of the Vulcan Iron Works, Chicago, died at his home in New Britain, Conn., on August 18, at the age of 65.

Joseph P. Topping, vice-president of the hardware firm of Topping Bros., New York, died suddenly of heart disease at his home on August 17, at the age of 55. Mr. Topping was a member of the Hardware Club and of the Engineers' Club.

Henry W. Swoyer of the Richmond plant of the American Locomotive Company, New York, has been made general manager of the Brooks plant of that company, succeeding W. A. Wheatley, resigned to go to the Canadian Locomotive Company, Kingston, Ont.

T. W. Snow, who has been western manager of the Otto Gas Engine Works, Chicago, for the last 12 years, announces that the T. W. Snow Construction Company, Chicago, has purchased all the patterns, drawings and tools of the railway department of the Otto Gas Engine Works, and that in the future it will manufacture the railway specialties that he has been handling. These will include repairs for coaling stations, water stations and standpipes previously sold under the name of the Otto Gas Engine Works, which will be handled with the consent and good will of the Otto Gas Engine Works.

The McKeen Motor Car Company, Omaha, Neb., has received an order from the Victorian Railways of Australia for two standard all-steel 70-ft. motor cars. While these cars will be practically the same as the standard design, they will have the following special features: The coupling device will be the same as that used on the railways in England, the cars will be divided into first and second class passenger and smoking compartments, and the track gage will be 5 ft. 3 in.. The McKeen company has also received an order from the Monmouth, Macomb & Southern, Monmouth, Ill., for a standard 55-ft. motor car, and one from the Oregon Short Line for a fourth 70-ft. motor car. There are now 118 of these cars in service in the United States, and 45 railways are either running or have ordered them.

TRADE PUBLICATIONS.

Chicago & Alton.—The passenger department of the Chicago & Alton has issued a booklet entitled Summer Trips to Vacationland, giving views and descriptions of the summer resorts on Lake Michigan by his road.

San Pedro, Los Angeles & Salt Lake.—The passenger department of the San Pedro, Los Angeles & Salt Lake has issued a folder giving special time table and colonist rates, effective September 15 to October 15, 1911.

Derails.—The Hayes Track Appliance Co., Richmond, Ind., has published a small illustrated folder telling how Hayes Derails were adopted as standard on the Harriman lines after undergoing a six-year test on the Southern Pacific under most diversified conditions.

Great Northern.—The passenger department of the Great Northern has issued a 36-page booklet entitled North Dakota, describing opportunities for farmers, stockmen and dairymen. The booklet gives current land prices, crop and soil conditions and a colored map of the state.

Telephones.—The General Electric Company, Schenectady, N. Y., has devoted bulletin No. 1105 to the selection, installation and wiring of inter-phone systems. This bulletin illustrates and describes 12 different systems, and tells how to choose the best system for each service. It also includes valuable information on the installation of sets.

Turbines.—The Kerr Turbine Company, Wellsville, N. Y., has issued catalog No. 19 of its turbines, ranging from 2 to 600 h. p., for high, mixed or low pressure steam. The principle, construction and advantages of these engines are clearly

described, and illustrations, dimension tables and instruction for writing for estimates are included.

Lathes.—The Niles-Bement-Pond Company, New York, has published an attractive catalog of its engine and gun lathes. Pond engine lathes are furnished either belt or motor driven and with three styles of drive: double back geared, triple geared and geared head. Bement engine lathes are built to swing work with a minimum diameter of 84 in. The catalog includes detailed descriptions and unusually large photographs.

Fireproof Products.—The Dahlstrom Metallic Door Company, Jamestown, N. Y., has published a folder called "Modern Travel," in which it tells how its fireproof products may be used in the interior construction of cars in such a way that it is almost impossible for the eye to distinguish it from wood. The folder then goes on to say that these products combine great rigidity, and little weight besides their fireproof qualities.

Coal Crushers.—The Jeffrey Manufacturing Company, Columbus, Ohio, has devoted a small illustrated folder to its new single-roll coal crusher. The efficiency of small size stoker coal is well known, and these crushers are built to reduce any kind of coal to any size lumps in a single operation. Simplicity and strength characterize their construction and their capacity is large. The descriptions, diagrams and tables show clearly the many merits of these machines.

Rings.—The Standard Steel Works Company, Philadelphia, Pa., has published a very complete catalog of its rings, shells and ring dies. This catalog, which is well illustrated, shows many types of this class of material, and specifies the purpose to which each is best adapted. It contains cuts showing gear rims and blanks for built-up gears for heavy electric service, and built-up wheels for bascule bridges. Dimension tables of peened, screw, welded and plain pipe flanges are also included. All parts are made of forged and rolled steel.

Titanium Rails.—The Titanium Alloy Manufacturing Company, Pittsburgh, Pa., has published a booklet called Titanium, The Best Rail Ever Rolled, in which it gives many convincing proofs of the superiority of this rail over others. The booklet says that titanium is the most powerful of all deoxidizers and removes at least a portion, if not all, of the nitrides as well. In one case titanium rails have withstood the wear and tear of traffic for a year without showing any appreciable wear where no other rails could be used for more than eight months. Some excellent photographs show titanium rails in perfect condition adjacent to other rails in a much damaged condition after they have both undergone the same service.

FOREIGN RAILWAY NOTES.

The school for railway service at Linz, in upper Austria, which was ten years old, was transformed in 1910 into course of instruction for the middle grades of railway service, and the railway officials of various branches of service were appointed instructors. The course includes the following subjects: Commercial service, 7 hours per week; transportation, 5 hours; telegraph, 2 hours; administrative service, 2 hours; materials, 2 hours; accounts, 2 hours; traffic geography and statistics, 2 hours; railway technology, 2 hours; railway law, 2 hours; railway history, 1 hour; sanitation, 1 hour; practice and inspections, 8 hours. All but history and geography are taught by active railway employees.

We noted years ago how the capacity of Russian freight cars was increased one-fourth by the use of the paint brush which erased the figures for weight on the side of the cars and painted in new ones. Latterly instructions were given to further increase the capacity, making it 32,500 lbs., and in many cases the transformation seems to have been made in the same simple way. At least the authorities report that only a small part of the money assigned for the purpose had been used up to March last, but that accidents caused by broken axles, and delays on account of hot boxes had greatly increased; consequently the railways were admonished to provide axles strong enough to carry a load of 32,500 lbs. We must remember that the cars have but two axles, so that there is a load of 8,750 lbs. per wheel, plus one-fourth of the weight of the car.

Railway Construction.

New Incorporations, Surveys, Etc.

Algoma Central & Hudson Bay.—An officer writes that the extension to be built by this company is to start from Hobon, Ont., on the Canadian Pacific, which is 194.5 miles north of Sault Ste. Marie. The route follows the east side of Oba lake and river, to a point on the National Transcontinental (Grand Trunk Pacific), at a point 142 miles west of Cochrane. The contract has been let to the Superior Construction Company, Sault Ste. Marie, and the work covers heavy clearing on the entire route about 101 miles. On the first 50 miles the average quantities per mile are as follows: Excavating solid rock, 5,238 cu. yds.; loose rock, 5,760 cu. yds.; common excavation, 14,625 cu. yds., and overhaul, 36,850 cu. yds. The balance of the work will average per mile: Solid rock, 93 cu. yds.; loose rock, 610 cu. yds.; common excavation, 16,330 cu. yds., and overhaul, 35,480 cu. yds. There will probably be two steel bridges in the future. The present construction work calls for putting up 25 pile bridges. There will be a number of stations, water tanks and a coaling plant. Work is to be started at once. Maximum grades will be 0.6 per cent., and maximum curvature 6 deg. (August 11, p. 303.)

Work is now under way by the Superior Construction Company, Ltd., Española, Ont., building an extension from Crean Hill. The contract includes the track laying, ballasting, stations, tank buildings, etc., on the Algoma Eastern, formerly the Manitoulin & North Shore. (February 24, p. 368.)

Algoma Eastern.—See Algoma Central & Hudson Bay.

Baltimore & Virginia.—An officer writes that work is now under way on a line through Anne Arundel and Calvert counties to Drum Point. The grading work has all been finished. There is to be three important trestles. H. L. White, president, and L. E. Holloman, secretary and treasurer, Baltimore.

Bangor & Aroostook.—This company has applied to the railway commissioners of Maine for permission to make ten changes in the location of the line on the Ashland branch between the junction at Oakfield, Me., and the station at Squapan junction. Many of the curves are to be eliminated and the grades will be reduced. The total construction will be 92,952 ft., including a bridge over the east branch of the Mattawamkeag river at Smyrna Mills, and three other small bridges. The station at St. Croix is also to be moved a short distance.

California Roads.—The Palmer Annex Oil Company has started work on the construction of a line, it is said, from Guadaloupe, Cal., to the Cat canyon fields, about 30 miles.

Canadian Pacific.—Train service on the Forward division has been extended west to Ogema, Sask., and on the Alberta division a new branch has been opened between Irricana, Alb., and Standard.

Central California Traction.—This company will build a line, it is said, from Lodi, San Joaquin county, Cal., up Dry creek, with extensions to Jackson and Sutter creek.

Coos Bay Traction.—This company is planning to build from Coos Bay, Ore., east to Roseburg, about 50 miles. G. F. Averill, Marshfield, is interested.

Crystal City & Uvalde.—Work is now under way on an extension from Gardendale, Tex., east to Fowlertown, 12 miles. The line is eventually to be continued to Tilden, thence to the new gulfport of Aransas Pass, about 150 miles. (May 26, p. 1222.)

Cumberland Valley.—An officer writes that it is understood that the Cumberland Valley will ask for bids at an early date for between 400,000 and 500,000 cu. yds. of grading in connection with the proposed revision of line through Chambersburg, Pa. (June 9, p. 1333.)

Edmonton, Dunvegan & Peace River.—According to press reports, J. D. McArthur, Winnipeg, Man., who has a contract for building an extension of the Hudson Bay Railway for the Dominion government, from The Pass, Keewatin, northeast to a point on Hudson bay, has bought the rights and property of the E., D. & P. R., and is arranging to make surveys for a second line to be built to Hudson bay.

HOUSTON & TEXAS CENTRAL.—This company has decided to build a cut-off, it is said, from Giddings, Tex., northeast via Caldwell to Stone City, about 50 miles.

INTERCOLONIAL RAILWAY.—Bids are wanted by L. K. Jones, secretary, department of railways and canals, Ottawa, Ont., up to September 15, to build section No. 1 of the Guysboro-Country Harbor line, from Guysboro, N. S., to Country Harbor cross roads, thence to deepwater, Country Harbor. Plans are on file with the chief engineer of the department of railways and canals at Ottawa; the chief engineer of the Intercolonial Railway at Moncton, N. B., and at the office of the board of trade at Halifax, N. S.

Bids are also wanted up to September 15 for building a branch line from Dartmouth, N. S., to Deans.

INTERURBAN CONSTRUCTION COMPANY'S LINES.—An officer writes that grading work is now being carried out by the company's men on an electric line from Invergrove, Minn., south via Hastings, Cannon Falls, Pine Island and Oronoco to Rochester, about 80 miles. A. T. Stebbins, president, Rochester, and W. L. Sountag, general manager.

KANSAS CITY, MEXICO & ORIENT.—See an item regarding new construction on this road under Railway Financial News.

LONG ISLAND RAILROAD.—Bids are to be opened by the Long Island August 28, for the elimination of grade crossings and electrification work on the North Side division between Flushing, N. Y., and Port Washington. (May 5, p. 1084.)

MAINE ROADS (Electric).—It is understood that the line from Skowhegan, Me., via East Madison village to Athens, 10 miles, will be built. The towns of Athens and Skowhegan have each voted to take $15,000 in stock, and the Maine Central will probably take an equal amount. The promoters include H. D. Eaton, Waterville; G. F. Ayer and J. E. Chapman, Athens.

MALIBU TIDEWATER.—Incorporated at Los Angeles, with $800,000 capital, to build a line between Santa Monica and Oxnard, with a number of extensions. The company owns 15 miles of line, built several years ago, into the Rindge lands, to the north of Santa Monica, and as soon as the necessary right-of-way is secured the old roadbed is to be rebuilt and put in shape for the operation of heavy equipment. M. K. Rindge, president, and N. D. Darlington, chief engineer.

MANITOULIN & NORTH SHORE.—See Algoma Central & Hudson Bay.

MISSOURI, OKLAHOMA & GULF.—The Oklahoma City Terminal Railway was organized August 7, with $75,000 capital, to build a terminal on the proposed extension to Oklahoma City, Okla., of the Missouri, Oklahoma & Gulf. (August 11, p. 304.)

OAKLAND & ANTIOCH (Electric).—An officer is quoted as saying that the company will build a branch from Walnut Creek, Cal., to Danville, seven miles. The company has under consideration the question of building a line to Martinez.

OKLAHOMA CITY TERMINAL.—See Missouri, Oklahoma & Gulf.

OREGON SHORT LINE.—According to press reports, this company is planning to build an extension in Idaho to cover both sides of the valley between Idaho Falls and St. Anthony, both east and west of the present St. Anthony-Idaho Falls branch; in all, about 80 miles. The plans include an extension of the present spur out of Elva to Grant, north to the Elgin bench country in Fremont county, thence to St. Anthony, crossing the main line at St. Anthony and extending southeast to a point three miles north of Idaho Falls.

PACIFIC ELECTRIC.—According to press reports, this company will build a line from Redlands, Cal., to Highland, five miles.

PECOS VALLEY SOUTHERN.—This company, which operates a line from Pecos, Tex., south to Toyahvale, 41 miles, is planning to build an extension of about 45 miles, to Alpine, and ultimately south to Boquillas, on the Rio Grande border, about 90 miles additional. (May 26, p. 1223.)

SALT RIVER VALLEY (Electric).—An officer writes that it has not yet been settled when contracts will be let to build from Phoenix, Ariz., to Scottsdale; also from Phoenix, via Tempe and Mesa to Chandler, and from Phoenix, via Glendale to Peoria. F. M. Winter, president, and J. C. Harwood, superintendent of construction and purchasing agent, Phoenix. (August 11, p. 304.)

STUTTGART & SOUTHERN.—Incorporated in Arkansas with $300,000 capital, to build from Stuttgart, Ark., south through Arkansas county to Bayou Meto, 25 miles. The incorporators include J. I. Porter, E. Tallman, J. L. Ingram and G. C. Lewis.

TEXAS ROADS.—According to press reports from Roma, Tex., T. H. Holson, representing a syndicate of eastern men, is back of a project to build from Del Rio, southeast parallel to the Rio Grande, via Eagle Pass, Laredo, Roma and Rio Grande City to Sam Fordyce. (May 19, p. 1187.)

TOLEDO & SILETZ RAILROAD & NAVIGATION COMPANY.—Incorporated in Oregon with $1,000,000 capital and office at Toledo, Ore. The plans call for building from Toledo, in Lincoln county, northeast to Dallas, in Polk county, about 40 miles. The company also plans to operate a system of boat lines on the Yaquina river. The incorporators include: C. R. Vrosno, E. J. Avery and J. Kentta.

TWIN CITY LIGHT & POWER COMPANY.—Work is now under way building a line from South Bend, Wash., to Raymond, five miles.

RAILWAY STRUCTURES.

AUBURN, WASH.—The Northern Pacific is asking for bids for putting up a 25-stall roundhouse machine shop and coaling station at Auburn.

BUZZARDS BAY, MASS.—The New York, New Haven & Hartford has ordered from the Strauss Bascule Bridge Company, Chicago, a 40-ft. single leaf, double track bascule bridge to be used over the Cohasset Narrows, near Buzzard's Bay.

CAMERON LAKE, B. C.—A contract has been given to W. C. Holt, Victoria, for putting up a station at Cameron Lake for the Esquimalt & Nanaimo.

CHICAGO.—Darius Miller, president of the Chicago, Burlington & Quincy, in an interview in Chicago says that it is hoped that work on some features of the new union terminal in Chicago will be started next spring, though final plans have not been adopted. The rough estimate of the total cost of the new station and terminal is $25,000,000, of which $14,000,000 will be for land, $5,000,000 to $6,000,000 for station, and $5,000,000 for changes in track and other improvements. It is expected that the station will be built east of Canal street, between Jackson and Adams streets, with trainsheds extending north and south long enough to accommodate 15 car trains. The main entrance will be on Canal street. The terminal will thus occupy practically the entire space between Chicago river and Canal street, and between Van Buren and Madison streets. Mr. Miller denied the report that it has been decided to use electric-motive power. The station is to be built and operated by the Union Depot Company, in which each of the five roads using the station own one-fifth interest.

DALLAS, TEX.—The Missouri, Kansas & Texas has awarded the contract for building a six-story office building. Plans have been completed and construction will begin as soon as possible. See Smithville, Tex.

DENISON, TEX.—See Smithville, Tex.

FALL RIVER, MASS.—Bids are wanted by the city auditor, up to August 29, for building a reinforced concrete bridge over the tracks of the New York, New Haven & Hartford at South Park, Fall River.

FLUSHING, N. Y.—See Long Island Railroad under Railway Construction.

FT. WORTH, TEX.—See Smithville, Tex.

GALVESTON, TEX.—The Gulf, Colorado & Santa Fe has let the contract for building the new roundhouse, storehouse, blacksmith shop, machine shop, power house and sand house mentioned in the *Railway Age Gazette* of July 14. The work will begin immediately and will be completed about January 1, 1912, at an estimated cost of $100,000.

GLENN, CAL.—According to press reports, the Colusa & Hamil-

ton will build a station at Glenn. This company was organized to build a 60 mile line from Harrington, on the Southern Pacific, to Hamilton.

Greenville, Tex.—See Smithville, Tex.

Kansas City, Mo.—The George A. Fuller Construction Company has sublet a contract to Callahan Bros. for the removal of 250,000 cu. yds. of earth for the basement of the new union station. The work will cost from $60,000 to $100,000, and will be finished in four months.

Port Arthur, Ont.—The Canadian Northern has given a contract to J. A. Whalen, Port Arthur, it is said, to build a bridge at a point 59 miles east of Port Arthur.

Quebec, Que.—Bids are wanted by P. E. Ryan, secretary of the commissioners of the Transcontinental Railway, at Ottawa, Ont., up to August 31, for the construction and erection of a terminal station in the city of Quebec. Plans are on file with Gordon Grant, chief engineer, Ottawa, and A. E. Doucet, district engineer, Quebec.

Ray, Tex.—See Smithville, Tex.

Reading, Pa.—Bids are wanted by A. L. Rhoades, county comptroller, Reading, up to September 14, to build a reinforced concrete viaduct over the Schuylkill river at the foot of Penn street, Reading. The structure will be 1,350 ft. long, 80 ft. wide, and will have nine 48-ft. arches, five 110-ft. arches and retaining walls. It is being built to carry street railway cars and highway traffic.

Seattle, Wash.—The Oregon-Washington Railroad & Navigation Company will build a new machine shop on Delaware avenue in Seattle, to cost $30,000.

Smithville, Tex.—The Missouri, Kansas & Texas, complying with a state law, has started construction on sheds for repairing and overhauling cars at the following points in Texas: Dallas, Denison, Ft. Worth, Greenville, Ray and Smithville.

Smyrna Mills, Me.—See Bangor & Aroostook under Railway Construction.

Tampa, Fla.—Bids are wanted by the board of public works, Tampa, up to September 6, for the construction of a reinforced concrete or concrete steel bridge, with bascule lift, over the Hillsboro river at Lafayette street, Tampa. The bridge will be 390 ft. between abutments, 80 ft. wide, with a 75-ft. draw span, and is to carry two tracks for street railways. D. B. McKay, chairman.

Wichita, Kan.—The Wichita Union Terminal Company has been authorized by the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the St. Louis & San Francisco, and the Kansas City, Mexico & Orient to separate grades through the city and build a new union station. The building will be located on the south side of Douglas avenue, between the present stations of the Santa Fe and the Rock Island. The terminal company has been authorized to issue $2,500,000 in bonds to carry out the project. Douglas avenue, the principal street of the city, is now crossed at grade by the Santa Fe, Rock Island and Frisco. The tracks will be elevated through the city for a distance of two miles, and subways will be built at Douglas avenue, First street and Second street. There will be a four track main line from the Frisco connection on the north to the Rock Island crossing on the south, with additional through passenger track and spur at the station. At Kellog street a re-enforced concrete viaduct nearly half a mile long will be built over the tracks of the Terminal company and over the tracks leading to the Santa Fe, Rock Island and Frisco freight houses. C. J. Skinner, formerly office engineer of the Santa Fe, will be the engineer in charge of the work.

The work of making up the unions of railway employees in Australia is being vigorously pursued. The Victoria Railways Union, which has been formed from the union of the Amalgamated Society of Railway Employees and the Transportation Society, has now taken a definite existence. Representatives of the railway union have conferred with members of the Carriage Builders' Society, with the result that that body is preparing to join. The Institute of Locomotive Engineers is also contemplating similar action.

Railway Financial News.

Carolina, Clinchfield & Ohio.—See Seaboard Air Line.

Central of Georgia.—The payment of the full 5 per cent. interest on the $4,000,000 first income bonds and the $7,000,000 second income bonds and a dividend of 1.458 per cent. on the $4,000,000 third income bonds has been ordered by the directors, payable October 1. These payments are for the fiscal year ended June 30, 1911. In 1907 and for two years previous 5 per cent. was paid on each class of security. In 1908 5 per cent. was paid on the first incomes, 2.8 per cent. on the second incomes, and none on the third. In 1909 and 1910 2.3 per cent. was paid each year on the first incomes and nothing on the others.

Chicago, Rock Island & Pacific.—At the annual meeting on October 12, the shareholders will be asked to authorize the payment of principal and interest of the $10,000,000 first mortgage bonds of the St. Paul & Kansas City Short Line, and the payment of principal and interest of $453,600 notes of the Rock Island, Arkansas & Louisiana for the purchase of 23 miles of road of the Little Rock & Hot Springs Western. (August 4, page 270.)

Detroit River Tunnel Company.—See Michigan Central.

Kansas City, Mexico & Orient.—This company proposes soon to issue additional 4 per cent. 50-year first mortgage bonds to the amount of $4,000,000, the proceeds to be used to build from Alpine, Tex., to San Sostenes, Mex. A line between these two points would complete the company's railway from its northern terminus to the west coast of Mexico, except for two short sections. The amount of these 50-year bonds now outstanding is $18,199,000. It is said that now, as in the case of former sales, the company will give a bonus in the shape of shares of common and preferred stock of the railway and of the company which has been formed to develop mineral lands in Mexico near the line of the road.

Little Rock & Hot Springs Western.—See Chicago, Rock Island & Pacific.

Michigan Central.—H. B. Ledyard, chairman of the board, has given out a statement to the following effect in regard to the standing of the Detroit River Tunnel Company bonds: "The original mortgage to the Guaranty Trust Company provides for an authorized issue of $30,000,000, of which $14,000,000 was reserved for future issue to provide for additions, equipments, etc. Of the remaining $16,000,000 only $14,000,000 was sold, about $12,000,000 of the proceeds of which has now been spent. A supplemental agreement has been made between the railway company and the trust company by which the $2,000,000 bonds of the $16,000,000 issue not sold are brought under the restrictions applying to the reserved $14,000,000."

Rock Island, Arkansas & Louisiana.—See Chicago, Rock Island & Pacific.

Seaboard Air Line.—It is understood that there will be a special meeting of directors in the latter part of September to act on the proposition to lease the Carolina, Clinchfield & Ohio.

This company has sold to Blair & Co., $1,500,000 4½ per cent. equipment notes maturing in 20 equal semi-annual instalments. The issue is to pay for 1,230 freight cars, 9 passenger cars and 25 locomotives ordered last April.

The New York Stock Exchange has listed $19,000,000 refunding mortgage 4 per cent. bonds, and has authorized the listing of $5,295,000, more up to January 1, 1912. The issue is mostly for refunding.

Southern Pacific.—A press despatch from California says that this company is to buy the Sonora Railway, in Mexico, which extends from Nogales on the Arizona line southward to Guaymas, 263 miles. The road is owned by the Atchison, Topeka & Santa Fe, but operated under lease by the S. P. It is of almost the same length as that section of the Santa Fe main line from Needles westward to Mojave, where the condition is exactly opposite, the road being owned by the Southern Pacific and leased to the Santa Fe. The directors of the Santa Fe have already laid before the stockholders a proposition to purchase this Southern Pacific line. The two proposed sales would offset each other, so far as mileage is concerned.